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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Our Paint and Varnish Issue

As announced in these columns some time ago, we intend to pursue the policy of publishing, if possible, once a month, a special number devoted largely to some definite branch of the chemical or metallurgical industries. The special numbers already issued have met with a success which amply justifies a continuation of the policy, and, in future, we propose considerably to augment the technical material given in these issues and to include a comprehensive series of special articles contributed by recognised authorities on the particular subject dealt with.

Our issue to-day is concerned with a subject which is of special interest at the present season, for it is during the Spring that the thoughts of all who hold positions of responsibility in works and factories turn to the question of upkeep of buildings and plant. This year the situation shows signs of exceptional activity, for the reason that re-painting work which has been deferred for some years owing to prohibitive costs can be delayed no longer, while the time is now most opportune owing to the considerable drop in price which has occurred in all kinds of paints. This fall has been occasioned mainly by the phenomenal decrease in the value of linseed oil, the price of which is now actually below the pre-war average. It should be emphasised, however, that prevailing prices are really of an artificial nature, and are due almost solely to forced realisations of stocks brought about by the general upheaval in financial circles. It will, therefore, be surprising if a fairly substantial rise in the price of paints does not occur when once the situation clears. The moral is, therefore, to carry out all that is possible in the way of painting while the time is favourable.

So far as the subject dealt with in this week's issue is concerned, THE CHEMICAL AGE has been fortunate in being able to arrange with some of the leading authorities on the chemistry and manufacture of paints and varnishes to contribute articles which, in addition to being of considerable service to the specialist, will also be interesting and informing to chemists whose spheres lie elsewhere. The chemical side of the question is concisely dealt with by Dr. R. S. Morrell, the President of the Oil and Colour Chemists' Association, while the innumerable products which the producer is nowadays called upon to supply are described by Mr. R. P. Koekkoek, who, as many of our readers will know, is in charge of the works department of one of the largest paint-making undertakings in this country. Mr. Percival J. Fryer writes on "Substitutes for Linseed Oil in the Paint Industry," Mr. George B. Jones on "The Preservation of Chemical Works' Plant and Structures," and Mr. A. R. Matthis (a new French contributor) on "Insulating Varnishes." Altogether the articles cover the subject comprehensively from several different points of view.

The Condition of Trade

A LETTER which we publish to-day from Mr. F. T. T. Reynolds, expressed in temperate and considered terms and based on a wide experience of export business, calls attention to the grave stagnation of trade from which this country is now suffering. Previous to 1914, it points out, chemicals and dyestuffs served as a barometer to the textile trade of the United Kingdom. While the indicator would stand at 30·5 at the beginning of the war, it is estimated that the corresponding figure to-day would be 03·5, an amazing drop, for which, as our contributor remarks, no parallel can be found within living memory. Many of the works using chemicals and dyestuffs are closed down, and the remainder are on short time. Usually in periods of depression the loss is partly compensated for by exceptional activity in certain branches. Now, we are told, "all alike are stagnant, and chemicals and dyestuffs for the time being are almost unsaleable."

There are many causes to which this condition may be attributed. Mr. Reynolds deals with one—the

increase of departmental restrictions on trade; this may be described as an aggravation of existing causes rather than a direct cause in itself, and the irritation it is producing is explained by the fact that the unavoidable obstacles are sufficiently numerous and serious to make unnecessary any artificial additions to them. With trade reduced to a minimum level, money abnormally scarce, consumption steadily dwindling, stocks waiting to be unloaded, and staffs being kept idle or even reduced, one would have thought that every possible restriction on trade would have been lifted, and every facility given for the promotion of business. On the contrary, trade was never more hampered by official regulations. The Dyestuffs Act has so far done little to help our own dyestuffs industry, though it has stopped, as it was intended to do, the import of foreign products. The German Reparations Act, instead of extracting money from Germany, has brought trade with Germany practically to a stop. The receipts under this Act amount to the paltry sum of £3,000, and if it is true that British importers are paying in full to Germany and paying themselves 100 per cent. duty on the invoice price to the Customs, even that sum comes out of British instead of German pockets. In addition to impending legislation of a further restrictive character, there is the exclusive policy of certain manufacturing firms which compels the merchant exporter to obtain supplies abroad which he would prefer to obtain at home.

In such circumstances it is perhaps natural to turn round and blame the Government for everything. It is folly, of course, to hold the Government solely responsible. The war itself has left behind inevitable consequences and burdens which the country must endure. The policy of the trade union organisations tends to prevent work when national solvency depends on its resumption and development. What, however, is true in the indictment of the Government is the fact that, instead of freeing trade from every restriction that can be removed, and encouraging every effort to keep business going, its policy has been to entangle traders in a mesh of new and complicated regulations. The result is that the business man is at his wit's end to know where he stands. He requires a staff to keep him in step with the orders issued from week to week. When he applies for advice, as in the case of the Reparations Act, either he has to wait until overworked officials can attend to him, or he may be given one ruling to-day, on which he acts, and another ruling to-morrow, which penalises him for his act. The blame is not due to departmental officials, most of them distinguished for ability and courtesy; it rests with the policy imposed on them. It is not easy to say just what would put everything right; but there is a very strong feeling that the Government should refrain from making conditions necessarily bad still worse by these wire entanglements, in which business men are becoming hopelessly involved.

Smokeless Fuel Problems

WHEN the subject of the low temperature treatment of coal comes up for discussion it invariably leads to argument. Ever since the days when the original "Coalite" came on to the scene there have been repeated attempts to justify low temperature carbonization as the last word in the economics of coal utilization; but, in spite of the accumulated experience of the last decade, we find authorities such as Sir Arthur Duckham calling attention to the fact that there has never yet been produced an absolutely satisfactory balance sheet of the process. In reality the position is that practically all the coal now carbonized in this country is dealt with on the high temperature principle; and, even though the secondary reactions in the carbonizing chamber may be destructive so far as a proportion of the evolved hydrocarbons are concerned, the process has at least survived as a profit-earning business for a number of years, and in the face of particularly active competition.

As an alternative to present methods, a system is proposed for which alluring claims are made in the way of recovered by-products, but when it comes to financial considerations too much is left to the imagination. The scientist, particularly if of a bigoted nature, is too apt to forget that the technical refinements of his process make an appeal which is quite of secondary importance to the question of the financial prospects when it comes to be discussed by business men, with whom the final verdict invariably remains. In other words, we all can appreciate that there are ideals in every industry, though we may not necessarily be able to afford to live up to them. Candidly, this appears to be the present position of low temperature carbonization processes. The opposition school are quite prepared to recognize many of the virtues which the newer method exhibits; but, before it can be whole-heartedly accepted, there must be definite proof of its money-making capacity.

In this respect, while in many ways partly sympathising with the aims of the low-temperature advocates, we feel that to hurl invective at their opponents is the surest way to injure their cause. Professor H. E. Armstrong does not appear to appreciate that his indictment of the gas industry, which was repeated in full measure at the Society of Arts recently, is only calculated to alienate what sympathy this great industry might have with his proposals. Moreover, the natural result is that he detracts from the value of the suggestions which emanate from his more sober-spoken coworkers. He closed his introductory remarks by saying that so far as the problem of the nation's coal was concerned it has been left to "the business promoter and the visionary to save the situation." So far as the established process of carbonization is concerned we do not altogether appreciate what is implied by the term "visionary," for it would seem that it is the visions of the past few years which are now profitably materialising, while it is the visions of the new process for which the majority are waiting to take more definite outline.

Perhaps, the most apt remark at the Society of Arts meeting was that of Dr. J. A. Harker, that the whole low temperature business depended upon the possibility of selling the smokeless fuel at the same price as was paid for the original coal, when the by-products would pay for running the process and providing the profits. Thus, the economics of the question would be entirely upset if the value of the by-products was not sufficient, when produced on a large scale, to provide the necessary amount.

Crossing the Bar

THE Profiteering Act, suffering from a gradual and painless decline, is officially timed to expire next month, and happily no attempt is to be made to revive it. No honourable record of its achievements, we believe, is contemplated by the undertakers, nor is any desired. In short, "no flowers, by request." The Act will pass unmourned, for it worried business people to a far greater extent than it served the public. Where we should have welcomed protection against the extraction of unholy profits from our depleted balances, it offered none; to make up for the omission, it vigorously sought to defend us from trifling exactions that did not much matter. The light it occasionally threw upon the operations of great combines widened the bounds of public knowledge, but did little, if anything, to change or limit those operations. The authorities responsible for administering the Act had just the right touch of genius for trifles. The merchant and the retailer engaged their particular attention, and the man who incautiously made two half-pennies' profit where only one was permissible paid the penalty.

The sovereign triumphs of the Act were achieved in the realm of soda crystals. From the long procession of prosecutions one might have inferred that washing soda at not more than three halfpence a pound was the one thing needful to the salvation of civilisation. No doubt it was all well meant, and if the steam hammer was too often employed to crack nuts, it was merely one more example of ill-proportioned zeal for the public good. A brave attempt was made in the last stage to find a pretext for continuing this benevolent inquest into the conduct of business, with a view to improving its morals, but the country definitely but firmly indicated that it could not afford the luxury. So the Act passes next month, unmourned, though possibly not uncursed by those modest citizens whom it singled out for unwelcome distinction.

The End of E.P.D.

MR. CHAMBERLAIN'S Budget statement promises little relief to the taxpayer. The only reduction is in the duty on imported cigars and champagne, and as these articles may be regarded as comforters, those who use them for the purpose may increase their sources of consolation and be correspondingly grateful. We have, however, the negative satisfaction of knowing that even the Chancellor has abandoned the idea of trying to extract any more from the tax-paying public. And the Excess Profits Duty finally disappears—commemorated with an elegiac story which will go down in Parliament's history as one of the few jokes which enlivened Mr. Chamberlain's financial expositions.

In the case of new industries established since the beginning of the war, the duty ended on December 31 last. Where two or more businesses were amalgamated during the war the tax ceases at the earliest date applicable to either of the amalgamated concerns. The general result is that the liability of the majority of businesses terminated on or before the end of last year, that for most of the remainder the liability terminated on March 31, and that a limited number continue their liability, but in no case later than August 4. The assessment of firms for the purposes of the duty has been a difficult business, and there are still a number of outstanding disputes to be settled. The tax itself, however, is practically repealed, and the people who have hitherto paid duty on excess profits will now be free to discover some trade on which they can make any profit at all.

New Acid Processes

WE understand that a meeting of manufacturers and others interested in certain new processes for the production of H. and Gamma acids is to be held at the offices of the Society of Incorporated Accountants and Auditors at 50, Gresham Street, E.C., on Tuesday next. As already stated, the announcement respecting these new processes, which appeared recently in THE CHEMICAL AGE, has resulted in numerous inquiries from home and abroad, and it is expected that some definite arrangements will be made for commercialising the process on a considerable scale.

The Calendar

May		
2	Society of Chemical Industry (London Section): "Fractional Distillation with Contact Ring Still-Heads," by Dr. R. Lessing; "Thermal Losses in the Gas Producer Process," by N. E. Rambush. 8 p.m.	Burlington House, Piccadilly, London.
2	Royal Institution of Great Britain: Annual Meeting. 5 p.m.	Albemarle Street, Piccadilly, London.
3	Royal Photographic Society of Great Britain: Ordinary Meeting: "Colour Photography," by H. S. Watkins. 7 p.m.	35, Russell Square, London.
4	Institute of Metals: Eleventh Annual May Lecture: "The Casting of Metals," by Professor T. Turner. 8 p.m.	Institution of Mechanical Engineers, Storey's Gate, Westminster, London.
5	Chemical Society: Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, London.
5	Society of Public Analysts. 8 p.m.	Burlington House, Piccadilly, London.
6	Society of Chemical Industry (Manchester Section): "The Utilisation of Nitre Cake," by W. H. H. Norris. 7 p.m.	Grand Hotel, Manchester.
6	Royal Institution of Great Britain: "War Developments of Explosives," by Sir R. Robertson. 9 p.m.	Albemarle Street, Piccadilly, London.

Books Received

EXTRA PHARMACOPŒIA OF MARTINDALE AND WESTCOTT. Seventeenth edition, Vol. II. London: H. K. Lewis & Co., Ltd., pp. 688. 17s. 6d. net.

THE FORMATION OF COLLOIDS. By T. Svedberg. London: J. & A. Churchill. Pp. 125. 7s. 6d. net.

CRITICAL MICROSCOPY. By Alfred C. Cotes. London: J. & A. Churchill. Pp. 104. 7s. 6d. net.

THERMODYNAMICS AND CHEMISTRY. By F. H. Macdougall. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. 391. 30s. net.

THE MECHANICAL PRODUCTION OF COLD. By Sir J. A. Ewing. Cambridge University Press. Pp. 204. 25s. net.

DRUGS IN COMMERCE. By John Humphrey. London: Sir Isaac Pitman & Sons, Ltd. Pp. 116. 3s. net.

CHROMIUM ORE. By W. G. Rumbold. London: John Murray. Pp. 58. 3s. 6d. net.

Preservation of Chemical Works Plant and Structures

Protective Uses of Paint, Varnish, Tar, &c.

By G. B. Jones, A.M.Inst.C.E., A.I.C.

CHEMICAL plant and the structures supporting and housing it present many and varying problems in works maintenance. The commonest materials used for plant and structures are wood, iron, and steel, and these are unfortunately readily attacked by a large number of common chemicals. One method of reducing the liability to attack is to use as far as possible materials which are not readily corroded. Much can be accomplished in this way by using ceramic materials and special alloys, or in cases where these special materials are not strong enough, by lining and covering wood, iron, and steel with lead, tiles, asphalte, vulcanite, enamel, &c., but for general plant construction it is obviously impossible, from economic considerations, completely to cover all exposed surfaces in this way.

Protective Coatings

It thus becomes of first importance to find the most suitable material, such as paint, varnish, tar, &c., and apply it in the best manner to form a protective coating over the exposed surfaces. Corrosive action is caused by many chemicals, and its rapidity is influenced by physical conditions; for instance, temperature plays an important part in corrosion. Generally speaking, warm dry conditions lessen the liability to attack, while any cooling below the dew point, or moderate heating in the presence of steam, tends greatly to accelerate attacks on metals, as moisture readily condenses on metallic surfaces.

This brings up the point that water is the chief agent of corrosion and the special enemy of paints. A perfectly impermeable paint or varnish—if it can be found—is the ideal material for use on all exposed metal surfaces. Heated surfaces, such as boiler fronts, require special paints. Ice plants, where there are necessarily low temperatures, need special treatment; here the aim should be to prevent condensation of atmospheric water vapour on metal surfaces. This can be accomplished by a covering of cork chips placed between two layers of paint. Oils, solvents and their vapours, also render ordinary paints useless, and special preparations are manufactured. These are not destroyed when exposed to solvents under certain conditions. By far the greater portion of all corrosion in chemical works, however, is caused by acid fumes, and, to a less degree, by direct acid contact in the case of spills and accidents.

It is a difficult problem to specify a paint for general use against acid corrosion, and the only satisfactory method is to study the actual conditions appertaining to each case as it arises. Sulphuric acid, sulphur trioxide, hydrochloric acid, nitric acid, and sulphur dioxide are the commonest acids met with. These may act in the form of liquids, mists, or vapours, either alone or in combination one with another, and may attack the available materials used for paint and varnish in a surprisingly diverse manner. A paint to withstand all classes of acid corrosion has yet to be discovered. There is a large variety of materials on the market, but few are really acid resisting, except perhaps under some special conditions, which may only occur at one particular works.

The Problem of Cost

The chief point to consider in all painting problems is the cost. If the high capital outlay involved by using non-corrodible materials of construction cannot be undertaken, a yearly expenditure on painting has to be faced to preserve and prolong the life of plant and structures. Naturally the smallest yearly average expenditure which will effectively protect the exposed surfaces is desirable. The life of painting largely enters into the cost, and it may be found more economical to use a cheaper paint and apply it more often than to use a very expensive paint at longer intervals. Small local corrosions caused by exceptional circumstances are apt to start serious trouble if the examination and overhauling is left for too long. On the other hand, to use a cheap paint which soon becomes partially ineffective is false economy.

For ordinary works use where no special corrosive conditions are likely to be met with many varieties of reliable paints and varnishes can be obtained. In all cases, however, where there is any tendency towards exposure to exceptional chemical corrosion all painting materials should be bought on the result of practical tests. Thin sheets of iron, not less than one square foot in area, should be painted with the proposed materials; these should be hung up and exposed for several weeks to similar conditions to which the structures to be painted are likely to be exposed. A reliable opinion as to how the painting will stand in practice can usually be formed in three months. If this precaution were only rigidly carried out, many failures and heavy painting charges would be avoided.

Interior Decoration of Laboratories

For the interior decoration of laboratories, offices, &c., finishing coats of enamel and washable paints are undoubtedly the best. Discoloration is the chief difficulty to be overcome; these classes of painting materials are usually not liable to permanent discoloration, and can be washed free from stains made by fumes. The general woodwork of buildings, such as window frames and doors, does not usually present any great difficulty. Care should be taken that all woodwork is painted with a good priming coat, preferably a lead paint, before erection. This specially applies to tenons and mortises. The other coats of selected paint should be put on as soon as possible after erection, before attachments are made to the woodwork, or fumes have started to penetrate the priming coat.

All woodwork used in plant construction which may be exposed to direct acid attack, such as lead lined acid tanks, vitriol chamber sides, platforms, &c., is perhaps best treated by creosoting before erection. To do this very thoroughly vacuum or pressure apparatus is necessary, but quite good results can be obtained by dipping the dry wrought timber into a hot bath of creosote and tar, and afterwards leaving it hung up to drain and dry before erection. This method has the objection that the timber is rather dirty to handle during erection, but it ensures all joints and the back of linings, &c., being well protected. Properly tarred timber will last two years before requiring re-tarring, except perhaps surfaces exposed to the weather side, which may require treatment each summer.

All local acid attacks should be immediately cleaned and neutralized and the woodwork re-tarred before becoming soaked with acid or water. It is a good plan to mix a little tallow with the tar before use, as this makes it easier to apply. Either refined tar or raw tar well boiled to free it from moisture should be used. It should be mixed with about 10 per cent. of lime or cement and applied hot. Special care must be taken to tar timber posts well before fixing them into the ground, which is liable to receive acid drainings. Red oxide is commonly used for internal woodwork not directly exposed to attack, and if this is finished with a good varnish which has stood a practical

test, very little trouble should be experienced from acid fumes. Before repainting such woodwork, it should be washed down with lime water to neutralize any acid.

Iron and Steelwork

Iron and steel work presents the greatest difficulties, and often necessitates heavy maintenance charges if corrosion is to be effectively kept down. The great point is never to allow corrosion or rusting to begin, as once this is started it is almost impossible to prevent future trouble, unless all old rust is completely removed before repainting. All structural steel work should receive a good coat of paint containing plenty of oil before leaving the makers' works. It should be stored under cover, and erected before the paint has become permeable to water, or, if there is delay, painted again before erection, but ends of sections and the inside of bolt holes should not be forgotten. The final painting and varnishing should be completed immediately after erection.

If the conditions are likely to be severe it pays to repaint in a few months after exposure to attack, and certainly before any signs of failure of the paint have appeared. This method may mean a rather heavy initial expense, but afterwards the paint will stand severe conditions with an annual painting only. Corrugated iron sheds exposed to severe fumes have been known to last for twenty years without any signs of corrosion, after having been well tarred or painted three times during the first year after erection, and afterwards once annually.

Anti-Corrosive Paints

There are many types of ready mixed paints and varnishes on the market for use on iron and steel, but all should be tested under practical conditions before use. Anti-corrosive paints can be divided into four classes, viz. :—

(1) Natural bitumen preparations.
(2) Coal tar products.
(3) Oxide paints.
(4) Graphite and silica paints.

All of these have their special uses, which have to be found out by experience. The base materials of the first two classes are themselves good corrosion registers, but the latter two classes largely depend on varnishes which are mixed with them, or are used as a final coat to render them impervious to water and thus to general corrosion. Bitumen preparations are often made up in the form of black varnishes. These stand best over a good coat of red oxide and boiled linseed oil, as they do not adhere well to bare metal surfaces, but are apt to crack and flake off. Oxide paints should be made with boiled linseed oil, as this is less permeable to moisture than raw linseed oil, and, of course, only chemically inert fillers should be used where there is exposure to chemical attack.

For good results a special final varnish coat should be applied, and great care is required in selecting a suitable varnish to withstand the particular conditions. A cheaper method which is sometimes quite effective is to mix red oxide with an acid resisting varnish and save the labour on a separate varnish coat. Direct sun rays, however, tend to blister varnish paints. Graphite paints with inert silicates have great covering powers, but several coats should be used so that all the pores in one coat are filled up by the coat on top.

Structural steelwork which has become badly corroded requires careful treatment before a satisfactory result can be obtained. All loose paint, scale, and rust should be scraped off, the whole washed with thin lime water to neutralise acid, and left to dry, then brushed clean with wire brushes to remove rust and corrosion as completely as possible. The first coat of paint should be of a sticky nature, such as red oxide mixed with a varnish, as it is difficult to fasten paint to steelwork once it has become badly rusted; the second coat can be an oxide, graphite, or bituminous preparation with a final varnish coat to finish.

Tarring

Instead of painting, tarring is often resorted to very successfully for iron and steel work. Certainly plant and structural steel work exposed to direct attack by acid liquids, spray, or mists is best protected by prepared coal tar. Dehydrated tar should be mixed with about 10 per cent. of either lime or cement and 10 per cent. of kerosine oil, tallow, or turpentine boiled up and applied hot. Tar should not be used where the temperature is so high that it would be liable to run and be a nuisance, but for general use on internal and external chemical plant it has some advantages over paint. It is cheap and can be applied by ordinary labourers under supervision. It is just as important thoroughly to clean rusty and corroded patches before tarring as before painting, and there is a danger that unskilled labour will not do this properly unless well supervised. Cast iron pipes for water, gas, &c., are best treated by dipping in some solution, such as Dr. Angus Smith's before delivery from the maker's works.

Parts of plant which are liable to repeated acid splashing, such as mixing and measuring tanks where a dipping rod is used, are best protected by lime washing which should be applied daily if necessary by the process operators to keep down corrosive action. Periodically the whole vessel or apparatus should be cleaned and tarred. Other points requiring special treatment are the flanges of pipe lines conveying corrosive liquids, and cocks and pump glands; these should be immediately covered with lime wash as soon as a leak is discovered, and after the leak is repaired should be cleaned and tarred. The bases of stanchions require careful watching, and are probably best protected by asphalte or anti-corrosive cement tarred over for a distance of one or two feet above the floor level.

Wrought iron bolts and nuts are usually severely attacked; these should be painted or tarred behind the nuts and washers while they are being put into place, and well painted when the structure or plant is done. Metal tie rods, bolts, straps, and plates used in wooden roof construction also require properly protecting before erection, and watching afterwards; cases have been known where a timber roof truss has apparently been in excellent condition when viewed from the ground, but found on close inspection to have the vital iron work in a most dangerous condition, due to rapid corrosion by acid fumes.

Corrosion must be expected on most chemical works, and it is a good plan to arrange the labour so that all local corrosion is at once attended to by liming, scraping, tarring, or painting by the process operators, instead of leaving local bad patches until the general painting is done once a year.

Unity Between Directors and Employees

THE spirit of healthy and friendly rivalry that exists between the Westwood Works, Peterborough, and Willesden Works, London, of Joseph Baker, Sons, & Perkins, Ltd., was evinced on Saturday last, when the football teams of these establishments played off their annual match. The Willesden team were at home on their own ground at Neasden, and after a strenuous game during which hard knocks were given and taken by each of the teams, the Willesden Works lost by 2—1. The Peterborough team were afterwards entertained to luncheon. Mr. E. H. Gilpin who presided, in describing the attitude of the Baker-Perkins Directorate, said that in play as well as in work it was the ambition of the Board to be side by side with the employees. The Board had endeavoured to put this spirit into concrete form in setting the Willesden Sports Club on its feet by providing them with a sports ground, and providing the wherewithal to purchase the necessary equipment. The Chairman of the Willesden Committee returned thanks, and announced a programme for cricket, tennis, bowls, &c., for the forthcoming season.

Substitutes for Linseed Oil in the Paint Industry

By Percival J. Fryer, F.I.C.*

THE recent phenomenal fall in the price of linseed oil down to a level which is actually below the pre-war average has for the time being shelved the consideration of substitutes for this oil *qua* substitutes. It is, however, pretty generally agreed that the present prices are due in whole or in part to forced realisations of stock consequent on the stringency of the financial situation, and that a substantial rise must sooner or later take place. When this occurs the question of possible alternatives for linseed oil in the paint and varnish industries will be once again to the fore as in pre-war times.

It has been customary in some quarters to regard linseed oil as the oil *par excellence* for paint and varnish manufacture, and to a certain degree this view is fully justified. For general all-round use, and especially for indoor work, it is unlikely that a more satisfactory vehicle will be found. It is, however, equally true that for some other classes of work linseed oil, by itself, is inferior to certain other oils and mixtures of such oils with linseed.

Thus, for general outside work, especially on the sea coast and for application to hot surfaces, it is advantageous to use a mixture of Menhaden oil with linseed up to a proportion as high as 75 per cent. of the mixture. Its employment is also advocated in the case of paints for use on structural steel and other metals. The objectionable odour of the crude oil was originally a serious drawback, but a number of processes have been patented claiming to improve the oil in this respect, although it is still scarcely advisable to use it in paints for interior work. Owing to the colour of Menhaden oil being usually dark, it is not so suitable for white paints. An advantage which is claimed for the oil in combination with linseed is that the resulting mixture is impermeable to water to a greater degree than is linseed oil alone.

Other oils are also held to effect a similar improvement, notably Soya oil, Lumbang oil and Perilla oil. The first-named oil would have been very largely employed in the paint industry during the war years had its use not been officially restricted to edible products owing to the scarcity of oils for margarine manufacture. When suitably treated, Soya oil may be made to dry almost as quickly as boiled linseed oil. The raw oil is preferably first blown and then given a heat treatment, and a very successful drier has been found composed of manganese, lead and cobalt linoleates having approximately metallic contents of 0·03 per cent., 0·02 per cent. and 0·01 per cent., respectively.

The chemical composition of Perilla oil would lead one to expect it to dry more quickly than linseed oil itself, but this does not happen in actual practice. It is nevertheless a very suitable oil to use in admixture with linseed. The tests made so far with Lumbang oil have been rather less satisfactory, but even in this case a mixture with linseed oil is probably more suitable for outdoor work than is linseed oil alone.

Another, and well-known substitute for linseed oil, viz., Chinese wood (Tung) oil has already for a number of years had a very considerable vogue, and for protection from corrosion of metal surfaces has given very excellent results, especially when used with a tungstate drier. Unfortunately the film usually produced by this oil is semi-opaque, which unfits it for some classes of work.

As regards other potential substitutes for linseed oil, it is not generally known that there are a large number of oil-bearing seeds and nuts, especially of Indian and South American origin, capable of yielding oils which, from their analytical constants, should prove eminently suitable for use in paints and varnishes. During the last few years freights have been scarce and dear and there has been little disposition to ship cargoes of new and as yet largely experimental products to this country. When the industrial situation has cleared and cheap freights are once more available, it is highly probable that drying oils from such sources will be on offer, since there are practically inexhaustible supplies of the raw materials available.

Oiticica Oil

Among all the oils from new sources recently examined, there is none which has shown more promise than the very remarkable oil obtained and examined by Bolton and Revis and named by them "Oiticica Oil,"† after the native term for the kernels. The samples examined were of Brazilian origin, in size about 1 in. long by ½ in. broad. The oil, of which there is a high proportion present in the kernels (over 60 per cent.) is semi-solid at the ordinary temperature, and obviously consisted of a solid fat in a medium of liquid oil. The remarkable feature of the oil is its extremely rapid absorption of oxygen from the air, and its correspondingly pronounced drying properties. So marked was its action in this respect that the drying and storing of the oil had to be carried on in an atmosphere devoid of air. Actual tests showed that when a portion of the oil was heated in a thin film at 100°C. it gained 4 per cent. in weight in three hours, and further heating up to 24 hours only showed a total gain of 4·5 per cent. For comparison, Tung oil treated in the same manner showed a total gain of only 2 to 3 per cent. in weight. The skin produced was uniform, and more transparent and continuous in character than that obtained with Tung oil.

On heating out of contact with air the oil evolves bubbles of gas, and at the temperature of 300°C. sets to a stiff jelly in a similar way to Tung oil. There is, however, this important difference: that whereas in the case of Tung oil the jelly is distinctly turbid, Oiticica oil under the same conditions gives *a clear transparent jelly*.

Although a complete chemical examination of the oil was not made, the figures obtained clearly showed that this oil occupies a unique position among all drying oils so far examined. It is safe to predict that when it is available in sufficient quantities for practical testing it will be found to possess very remarkable properties. A point to be specially noted is the large proportion of solid fat present. When this is eliminated by pressing, the resulting oil will certainly possess greatly enhanced drying properties.

Further research and examination is, of course, necessary, but it would seem even possible that the liquid oil will be able to confer drying properties on otherwise non-drying animal and vegetable and even mineral oils. The writer understands that further supplies of the seeds will shortly be available for testing, and the results obtained will certainly merit the attention and interest of all concerned in paint and varnish manufacture.

* Author of "Technical Handbook of Oils, Fats and Waxes." Two vols. Cambridge University Press.

† Pronounce "Oy-ti-ki-ka."

Finsbury College Old Students' Association

THE Annual Smoking Concert at which nearly 100 Old Students and their friends attended was held at Anderton's Hotel on April 22, Dr. G. T. Morgan, F.R.S., in the chair. During the evening a Wallis-Jones Medal was presented to Mr. L. Gowing-Scopes, F.C.S., for the best paper contributed during the year by an old Finsbury student, his paper being on "The Properties of some Chlorhydro-Carbons, and their Uses in Chemical Analysis." The musical programme arranged by Mr. L. M. Clark left nothing to be desired. Old Students who are not members of the Association may obtain application forms for membership from the hon. secretary, Mr. H. P. Guy, 209, Northumberland Park, N.17.

The Chemistry of Paints and Varnishes

By R. S. Morrell, M.A., Ph.D., F.I.C.

To discuss adequately the general chemistry of paints and varnishes is a matter of great difficulty, because in some respects the ordinary chemical laws seem to be inapplicable. The connexion between chemical composition and properties is often early manifested, but sometimes it is indefinite and occasionally in practice it is negligible. It is not surprising that paints and varnishes have been considered solely from the craftsman's standpoint. Progress has been uneven and from the methods of investigation employed the industry is wrapped in a thick cloak of trade secrets.

For a paint or varnish to serve as a protective coating for structural material two important factors must be considered:

(*a*) The function of the binding medium.

(*b*) The nature of the pigment or resin, and their influence on the binding medium.

In applying a "drying oil" medium to a non-absorbent surface the subsequent chemical changes are essentially those of oxidation and polymerisation. When thickened oils have been used the polymerisation has been performed separately, and the absorptive power for oxygen modified and generally reduced. In paints, in addition to the obscuration of the undercoat for decorative purposes, the pigment gives a two-phase system of solid-liquid, wherein the rigidity of the system is greater than its corresponding viscosity or resistance to shear. The thickness of the film with a drying oil medium is limited mainly by one factor, that of viscosity, and it is obvious that such is limited by considerations of practicability. The pigment in a paint gives a means of applying a heavier or thicker coating than would be possible in its absence.

Varnishes may be classified as follows: (*a*) Those which consist of a medium similar to that of paints consisting of linseed or other drying oils and a thinner, the hardness of which is increased by substances miscible or soluble in drying oil (resins, bitumens, &c.); (*b*) those which consist of a solution of a resin or bitumen or resinous-like substance in a volatile solvent.

It is evident that in class (*a*) the variety of chemical changes will be most marked, whereas in class (*b*), after the escape of the volatile solvent or thinner, the general weathering action will depend on the chemical composition of the resin, &c., employed. The primary effect of the resin is to confer lustre and hardness on the oxidised oil film, which is elastic, but comparatively soft in the case of linseed oil and drying oils generally. The resin itself is devoid for all practical purposes of elasticity, but it is hard and very resistant to atmospheric effect and therefore stable, of high refractive index, and therefore conferring gloss. Although the combination of oil and resin in a varnish has not the same viscosity as in the oxidised film, yet it is too viscous to be applied without the addition of diluent in the form of turpentine or a substitute. It is not my intention to enter into a discussion on the difference between them, but generally it is admitted that the former is superior because of its greater viscosity, smaller range of distillation temperature, which admits of its easy application, and greater solvent property. As an absorbent of oxygen it is a very limited catalyst. In many cases the oxidation of turpentine to give a resinous viscous material is a decided advantage. Petroleum thinners are essentially inert solvents. The remaining important constituent of the paint and varnish medium is the "drier" or accelerator of oxidation of the drying oil.

Drying Oils

The drying oils with a few exceptions are open-chain glyceryl esters of acids containing not less than 18 carbon atoms. Recently Chapman & Tsujimoto have studied independently interesting components of shark liver oils containing unsaturated hydrocarbons, *e.g.*, spinacene $C_{29}H_{48}$ (Chapman).

The active constituents of drying oils of vegetable origin are the glyceryl esters of linolenic, linolic or elæostearic acids, the latter of which occurs in China wood oil, and similar oils from other seeds. The primary chemical change is oxidation, presumably by the formation of peroxides by addition at the unsaturated carbon atoms. Subsequent changes result in the formation of linoxyn, which is the binding material in all oil paints and varnishes, and is the basis of linoleum. Linoxyn consists of peroxides and oxides of the glyceryl esters, partly polymerised, with polymerised decomposition products of the peroxides in the form of aldehyde products.

A variety of decomposition products are possible, and the evidence of polymerisation is strong. The percentage of linoxyn in an oil film is higher if the oil has been previously polymerised by heat. A careful study of the degradation products is much wanted, and the results would throw light on the structure of this most important substance. Many of the difficulties arising from the weathering of films would disappear if its constitutional formula were known. It is probable that the peroxidised oil produced on drying reacts with unoxidised oil according to the scheme $AO_2+A=2AO$, the latter being the normal oxidised product, the diffusion through the film to produce the oxide varying under different conditions of light, humidity and temperature. If there is more than one unsaturated glyceride present the reaction may be expressed: $AO_2+B=(AO+BO)$. Wolff ("Farben Zeit.," 1919, 24, 1119) has found that in the drying of varnishes alteration in volume occurs in different zones with consequent production of shrivelling on exposure to yellow, orange, or red light during drying. In red light polymerisation is retarded more than oxidation, whereas in light of short wave-length polymerisation and oxidation proceed at equal rates.

There is another aspect of the changes which occur during the oxidation of linseed oil, to which I have referred in the Third Report on Colloid Chemistry, viz.: the so-called oxidised oil is probably a dispersed phase in partially oxidised or unoxidised oil (or resin in the case of a varnish). The properties of a varnish are likewise profoundly modified by the degree of dispersion of resin and oil, either together or separately in the varnish medium. If this view is correct such an arrangement would be inordinately sensitive to slight variations in conditions. Again the importance of determination of the structural formula of linoxyn or its chief component would be of great assistance in understanding and forecasting its properties in the gel condition.

In the changes occurring in the oxidation of linseed or any drying oil it is necessary to consider changes in volume, in density and increase in weight. The passage of linseed oil to linoxyn (solid) is accompanied by an increase of 17·9 per cent. in weight, 14·3 per cent. in density and 3 per cent. in volume. After three months the increase in weight had dropped to 10·3 per cent., showing escape of volatile oxidation products; the density had risen by 18·6 per cent., but the volume had decreased by 7 per cent. on the original oil. This affords a simple explanation of paint surfaces which is a common feature of old paint work, whether industrial or artistic. It must be remembered that when linseed oil is oxidised the weight of oxygen absorbed is much greater than the actual increase in the weight of the oil, owing to the loss of volatile matter in the form of carbon dioxide, formic and acetic acids, aldehydes (acrolein C_3H_4O) caused by the disruption of the molecule, presumably where oxygen has been attached at the double linkages. It is generally admitted that the glyceryl radicle is not attacked in the first stages of the change, although it has been stated that glycerine is formed in the presence of moisture subsequent to the production of linoxyn.

The Action of Driers

The action of driers to accelerate the setting and hardening of paint and varnish films introduces a discussion on Catalysis (J.S.C.I., 1920, 39, 153). In view of the undetermined composition of linoxyn, it is unwise to rely on quantitative expressions—*e.g.*, the velocity of oxygen absorption varies with the cube root of the concentration of the catalyst. The statement by Ingle that a metal which can form more than one oxide acts as a drier or oxygen carrier when it is in an oil soluble form, provided that the salts of the lower oxides are more stable than those of the higher oxides, may be considered as broadly true. Cobalt and manganese are stated to have a stronger catalytic activity than lead, but to obtain the best drying effect a combination of either with lead is much preferred. Any order of arrangement of metals according to their drying powers is not generally satisfactory; but man-

ganese, cobalt, lead, iron and cerium have definite drying powers. Usually manganese, cobalt and lead in the form of resinates, linoleates or tungates, as well as their oxides, acetates or borates are employed. Generally, increased quantity of lead gives increased drying power, whilst beyond a certain limit manganese and cobalt have no accelerating effect. In the autocatalysis without drier it must be assumed that a higher peroxide is formed which reacts with unoxidised oil—*e.g.*, AO+A=2AO. If the theory of intermediate compounds (Engler) be accepted, the scheme suggested by Ingle (J.S.C.I., 1916, 35, 454) is very probably correct.

In heterogeneous systems, such as paints, or where solid driers are used, the reaction will be influenced by the active volume of the catalytic material. Consideration of the surface concentration of the catalyst as the active mass, combined with the rate of diffusion of the reactants to and from the surface, may help to distinguish between cobalt, manganese and lead as driers, and may account for the view that cobalt and manganese are surface driers, whilst lead causes the film to dry uniformly. The porosity and water absorption of oil films are factors of great importance. The water absorbing power of linoxyn is slight compared with that of a drying oil, and the greater the amount of linoxyn produced the more water-resisting is the coating. The concentration of linoxyn in a film containing a thickened drying oil is greater in amount than that obtained from ordinary linseed oil. It is for that reason that the introduction of polymerised oils into a paint or varnish adds to the durability of the film, with due consideration as to the properties of flow.

I am inclined to attach considerable importance to the determination of the water absorbing power of oil paint and varnish films. The effect of the pigment in a paint on the production of an impervious film of linoxyn is shown by the lower absorption of a white lead paint compared with that of a red oxide paint. It must be pointed out that due consideration must be taken for the maintenance of the elasticity of the film. When water is absorbed by a varnish film to produce chalking, an emulsion of water in the film is produced, blisters form and the film becomes detached from the surface. The varnish film acts as a semi-permeable membrane, but there is no penetration of ions of the salts present in the water; moreover, sea water is absorbed to a less degree by a film than distilled water. There are indications of a surface absorption of certain metallic ions by the varnish film, especially in the case of calcium, and in this respect the varnish films resemble casein or gelatine.

It is evident that the liquid binding medium of paints and varnishes should excel in the following particulars:—

(1) Chemical permanence; (2) imperviousness to air and moisture; (3) elasticity and resistance to physical damage; (4) setting and drying power; (5) chemical inertness towards the covered surface; (6) electric insulation (for paints and varnishes applied to metals). It is impossible to obtain these desiderata with ordinary linseed oil only, and it is customary to add thickened linseed or other drying oils—*e.g.*, China wood oil suitably treated—provided that easy working and uniformity of admixture are maintained.

The Chemistry of Paints

In paints, varnishes and enamel paints the "grinding in" of the solid pigment or incorporation with resin or bitumen, with suitable thinning, gives a product whose properties are a modification of the binding material by the introduction of fresh components or phases. The modifications are partly physical and partly chemical. In the case of varnishes the physical effect has been already indicated, but in paints the physical condition of the pigment must be considered. The size of the pigment particles (C. A. Klein, Proc. Oil and Colour Chemists' Assoc., 1920, 3, 177. Lowry, B. Barytes Assoc., 1921), the oil absorptive power of the pigment, its colour, solubility in water, its tinctorial power as well as opacity, all require consideration in the selection of a pigment

High opacity in a film would be obtained by a combination of pigment and medium of refractive indices as far apart as possible. The spreading power of a ready-made paint depends on the composition and physical texture of the pigment, as well as on the proportion and composition of the medium, with proper attention to the hiding power and easy flow on application. One of the most interesting recent contributions to the practice of scientific paint technology is by Bingham and Young, who state that paints are plastic solids in contradistinction to viscous solids, and in development of this view the explanation of the "shortness of a paint" is forthcoming. Detailed treatment of the above properties would require more space than is allotted for this article, and only a few aspects can be considered.

The suspension of the pigment in the medium depends on the fineness of pigmentation and on physical and chemical action between it and the medium. If the medium is water and the system becomes one of two liquid phases with a solid phase (oil, water and a pigment as in a water paint) questions of surface tension and consideration of the general properties of emulsions arise. This field of research has been very little explored, and much organised research is desirable. There are many unknown factors and fresh ones appear continually—*e.g.* (*a*) the role of the emulsion former (often the pigment) depending on the reduction in size of the particles to a certain minimum; (*b*) the role of the emulsion promoter which must be soluble in one or both of the liquid phases deciding the stability of the emulsion. The emulsion promoter forms a sheath around the individual drops of the disperse phase (oil). In view of the desirable tendency to use water as a thinner in place of turpentine or petroleum it is evident that the study of such emulsions in paints and certain varnishes is of great importance.

From a chemical standpoint the pigment in a paint would be affected chiefly by weathering agencies of which rain (town rain) is the most important, containing as it does many acid impurities. Some are more susceptible than others, and some are quite inert.

It is impossible to consider in detail the effect of the pigment on the medium. The paint will possess properties dependent on both, but there may be certain chemical effects on the medium which may be advantageous. The comparative impermeability of a lead soap found in small quantities when white lead is used, is probably responsible for the enhanced physical properties of the paints of which it is the component.

Among other pigments having decided effect on the medium may be cited those which affect it by reason of their basicity or power to neutralise lower fatty acids, formic or acetic, &c., from boiled oil during oxidation (*cf.*, livering of certain pigments) and those influencing favourably the oxidation by virtue of their containing a compound of a metal which acts catalytically as a drier—*e.g.*, certain ochres, umbers, &c., or unfavourably by reason of deleterious impurities. It must be remembered that pigments are often present in a colloidal condition such as zinc oxide in enamels or Prussian blue in oil. The chemical activity of colloidal pigments may be widely different from what is manifested under ordinary conditions, and it is difficult to forecast with certainty the properties of paint from a knowledge of its composition. The paint value of any pigment is determined by a large number of factors, and only by judicious blending of these factors can a satisfactory product be obtained.

The Chemistry of Varnishes

The varnish value of any resin is determined by a number of factors, of which a few may be stated—(1) the solubility in oil or other media; (2) the behaviour on sweating to ensure incorporation in a medium, *e.g.*, gum running; (3) the acidity of the resin; (4) hardness; (5) lustre; and (6) behaviour with pigments in enamels.

From a chemical standpoint it is of importance to consider the acidity or ester value (*cf.*, "feeding up" in certain enamels), whilst the composition and structural formula are to a great extent unknown, and in practice are almost entirely neglected. There is no doubt that chemical composition exerts an influence as is shown by the contrast between resin and copal varnishes in durability, but the differences between copal and rosin varnishes are now much less marked. There are differences in surface properties of "long-oil" and "short-oil" varnish films, as is shown by the wetting power. The presence of the resin during the formation of linoxyn in the drying varnish may result in the setting up of stresses and strains which may cause surface inequalities. It must not be forgotten that copal varnishes are somewhat unstable emulsoids or suspensoids, very susceptible to irreversible changes under extreme or varying atmospheric condi-

tions. It is essentially the fine differences in the properties of varnish films which decide between success and failure, and it is not surprising that there is much to be learnt as to the connection between properties and composition.

The development of the artificial resins may be of assistance in this respect, although at present only one "albertole" is soluble in oil, but its price is too high.

Of the spirit varnish resins, shellac and resin have received the most attention, and bleached or transparent shellac or resin glycerides undergo definite chemical treatment before being incorporated into a varnish. A systematic investigation of the methods of analysis of varnishes is much wanted.

The bituminous varnishes are in a class by themselves, in which pitch functions as resin by its very close resemblance, and the chemical composition factor is of minor importance compared with that due to the physical properties.

A Key Industry

The manufacture of paints and varnishes might be included among the key industries. The application of paint and varnish means the protection of wood, metal, concrete and stone from corrosion and weathering. "Save the surface and you save all." Successful and rapid methods of painting and varnishing are labour problems. The problems of the protection of iron and steel and non-ferrous alloys are of increasing importance and demand systematic investigation. Against weathering there are few materials that require no protective coating. Gardner in the frontispiece of "Papers on Paint and Varnishes," aptly illustrates the importance by an illustration of a battleship with the following lines—

"Protected with color and pigment and var(nish)
To the uppermost tip of the topgallant spar."

The Preparation and Use of Modern Varnishes

By P. R. Koekkoek

THE average present-day manufacturer knows quite a lot about the varnishes he requires, but all do not realise that many first-class varnish houses spend yearly many thousands of pounds on scientific investigations; the results of this research is that many products are now made which, although coming under the name of varnish, are really triumphs of industrial research. Some manufacturers avail themselves of this research, and turn to the varnish chemist to solve many of to-day's problems; but there are others who do not realise the possibilities of, or the economies to be effected by, the use of well-made specialised varnish.

There are few trades in which varnish does not creep, its function being primarily protective; but there are cases where it is judged by the beauty it imparts more than by the protection it affords. In the piano trade, the high gloss finish is greatly prized; but the well-known French polish process, which is used, needs the use of highly skilled craftsmen, and the process of French polishing is also very lengthy, and consequently costly. Here the varnish chemist has reduced cost of production to the piano manufacturer by supplying a varnish which is applied by brush or spray, and after the application of three coats only a highly polished surface is produced in a few minutes by rubbing over with a liquid, supplied with the varnish.

The introduction of wood oil during recent years has proved invaluable to the varnish chemist. The old accepted theory that quickness of dry was only obtained at the expense of durability has been considerably modified by this remarkable oil. A good durable varnish for outside use can now be made to dry in a few hours; a very valuable asset in these days of rush, quite apart from the obvious fact that a quick-drying-varnish will collect less dust and dirt during the drying process.

That much-abused product of the Georgian pine, common rosin, has to-day come into its own, thanks to wood oil and research.

Rosin, which consists almost entirely of resin acids, is combined with glycerol, the ester thus produced suitably "cooked" with wood oil produces varnishes which are claimed by some experts to be more durable than the finest linseed oil copal products. Mention must also be made of the great resistibility of wood oil varnishes to water and steam, and the valuable property they possess of "drying" in a damp atmosphere. Varnishes possessing these properties are frequently demanded by manufacturers, and the ability to supply such varnishes has proved invaluable to many industries.

It is frequently stated, and not entirely without justification, that the varnish which covered the ancient Egyptian's mummy case differed but little from those made by the Monk Theophilus in the 16th century, and that little progress had been made by the middle of the 19th century. Under the present-day conditions the varnish maker has had to broaden his views.

The modern electrical industry opened up a new fruitful field of research, many properties were demanded of varnish by the electrical engineer; amongst these can be mentioned the value of varnish as an insulating material.

The well-equipped varnish chemist has at his disposal specially-designed apparatus for testing electrical resisting properties, and varnishes are now supplied to manufacturers of electrical plant accompanied by a copy of the report from the National Physical Laboratory giving breakdown volts per 0·1 mm.

Electrical varnish must be non-hygroscopic, and in some cases must be unaffected by continued immersion in transformer oil.

Tin Box Requirements

Tin plate printers are faced with many problems connected with the decoration of tin boxes and cans. A vast amount of research has been carried out, and some very wonderful varnishes produced. In the ordinary run of varnishes, elasticity is usually only obtained at the expense of hardness, and vice versa.

Tin box makers first coat the tin plate with varnish and then, in a stamping machine, stamp out square boxes and flat circular tins.

The most elastic of varnishes will not stand this severe treatment unless elasticity is combined with great hardness. Varnishes made for this process are not "air drying," the tin plate after being coated with the varnish is placed in a stove and heated for a few hours from 140°F. to 400°F., time and temperature varying according to the kind of varnish and local conditions. Some tin plate printers cannot obtain a high temperature, and if the box is decorated with light colours they would darken if too strongly heated. In other cases speed is the great desideratum; in the latter case stoving is carried out for one or two hours at the higher temperature. It is therefore necessary to produce a variety of varnishes to meet the varying conditions.

It had been alleged that all varnishes come from the same tank, but one could write at great length on the variety of products produced by the varnish manufacturer for the different industries.

Varnishes supplied to the brush maker would do sorry service if supplied to the ship builder, and even the manufacturer of hair pins demands a different varnish according to whether the pins are for the use of brunette or blonde.

The manufacturer of boot eyelets is very hard to please. The continual rubbing of the boot lace against the eyelet soon wears out the varnish unless the latter is of the toughest variety; and here, again, stoving is resorted to to obtain the desired result.

Manufacturers of playing cards have to be specially catered for. They require a high gloss, giving the cards a fine finish; that they should not become sticky with handling is, of course, a sine quâ non, and, further, the colour must be water white. All these conditions are only fulfilled by a type of celluloid varnish.

The damp wall problem is a subject which has received the attention of the varnish chemist. Many old houses, and for all that new ones, show at certain periods wet patches on some walls. If the patch is clear of ground level it is usually due to a too porous wall; complete immunity from this trouble can

then be obtained by coating the wall with a suitable damp-resisting varnish. Many manufacturers prepare special products for this purpose. However, too much is frequently expected of these varnishes. Where the damp penetrates from the ground upwards due to the absence of, or to a defective damp course, the varnish treatment becomes non-effective. A period of dry weather should always be chosen for applying damp-resisting products.

Alkali Resistants

Varnish compositions to resist alkali are frequently demanded. Alkali acting on ordinary oil varnish saponifies the oil, the net result being complete destruction of the protective film. The sluice gates of the River Nile are a good example of a structure which is subject to attack by alkali, these salts being present in the water of that river at certain periods of the year. A satisfactory varnish for this class of work must of a necessity be free from a large percentage of oil or easily saponified resin.

Bitumen forms the base of these protective coatings, sufficient being present to protect any oil and resin used. The resulting varnish is, owing to the asphalt used, black in colour, but the colour can be largely modified by the use of strong staining pigments.

Varnish mediums for manufacturing paint for use over concrete can be prepared free from bitumen, and consequently pale in colour, by making use of the acids present in certain resins. In this case, the lime does not destroy all the medium, but forms a kind of cement with the acids in the special resin used, the action not proceeding beyond the point of contact between the cement and varnish.

The effective protection of steel from corrosion is a problem that has yet to be solved by the varnish and paint chemist. No medium has yet been prepared which can be said to be really effective. Iron and steel under the combined action of oxygen, carbon dioxide and water vapour becomes converted into ferric oxide, commonly known as rust. The task set the chemist is not only to prepare a protective coating which will not allow the passage of these enemies of steel structures, but also prevent corrosion from taking place underneath any such film applied. At a certain stage during the rusting process, water, oxygen and carbon dioxide are all at one time combined with the iron, the carbon dioxide and water being eventually liberated, and available for more destruction. If this stage has been reached on some obscure spot prior to application of the varnish medium, the process of rusting goes on under the protective film, eventually breaking the said film and enabling fresh arrivals of the enemies of steel to enter. It is this contingency that has prevented the preparation of a satisfactory medium; consequently the steel chemist has got ahead of the varnish chemist, and prepared a steel which is claimed to be rustless. This rustless steel, owing to its peculiar properties, high cost and difficulty experienced in working, has not been found an application in structural work. There is still, therefore, scope for the varnish chemist in this field of research. What will be the outcome of this contest between the metallurgist and varnish chemist, time alone will tell.

The raw materials at the disposal of the varnish maker consist of resinous exudations of trees, in some cases natural, in others due to injury by man or insect. There is also the fossilized variety being the resin deposited in past ages by the trees of primeval forests, which latter have long since passed away, leaving only the resin, which, through the centuries has become as hard as stone, obtained in some cases a melting point as high as 600°F., and developed a remarkable resistibility to the solvent action of most oils and spirits. These fossilized resins known as the copals are greatly valued for the hardness they impart to varnishes.

Black Varnishes

Natural asphalts found deposited in various parts of the world, artificial pitches by-products from the distillation of oils and fats are a necessary part of black varnishes. Oils used for varnish making are chiefly obtained from vegetable sources, and must possess the property of changing from the liquid to the solid state when exposed to the air in thin layers, and are classed as the so-called drying oils, although this change from a liquid to a solid can hardly be described as drying, but is the result of a chemical change caused by the absorption of oxygen from the air.

The resins, asphalts and oils having been suitably "cooked" together, would be too thick for use, consequently various spirits are used for thinning the varnish to such a consistency that it can at normal temperature be applied by the spray, brush, or by dipping.

There still remain to mention the acetate and nitrate of cellulose, they being combinations of cellulose with the acids named; solutions of these in various alcohols and esters go to make the celluloid varnish.

Certain metallic oxides and salts are necessary ingredients in various varnishes, their function being to speed up the absorption of oxygen from the air. Less than 1 per cent. is incorporated in the varnish during the "cooking" process. Lead, manganese and cobalt are the metals most frequently used.

Coloured varnishes and lacquers are obtained by staining with aniline dyes, specially made "spirit and oil soluble." Coloured pigments are also used for this purpose, but then the varnish approaches an enamel in composition.

With these resources the varnish chemist, who must also be a skilled gum runner and oil boiler, tackles his industrial problems.

In this article an attempt has been made to demonstrate the utility of varnish as made under the control and direction of science.

In conclusion, a few hints on the storing of varnish. Always avoid keeping an ullage, whether in a gallon can or a barrel. It must be remembered varnishes change from the liquid to the solid state by virtue of the oxygen of the air they absorb; consequently if a large surface is exposed this "drying" process proceeds in the package. A skin is first formed on top, which is broken if package is incautiously moved, a second skin being formed, and so on, eventually the varnish becomes too thick for use, not to mention being full of skin. The remedy is to order several small packages rather than one large one. Varnishes should always be kept at an equable temperature, if varnish becomes chilled it is liable to become cloudy, resulting in loss of gloss.

Methylated spirit varnishes should not be stored in tins, as discolouration results. Always buy in wood or earthenware containers.

Spirit varnishes in general, do not suffer so much from exposure, beyond losing some of the volatile spirit; if much is lost the varnish naturally becomes too thick for use. Methylated spirit varnishes should also be kept away from a damp atmosphere, as alcohol will absorb water vapour from the air, resulting in deterioration of the varnish. An oil varnish will throw down a cloudy deposit if exposed to damp.

Varnish is worth looking after and amply repays, by results, care bestowed on it whilst in store.

Scarab Oil Burning Co., Ltd.

IN view of the general shortage of coal arising from the coal strike, and the serious effects it is having on all branches of industry, the oil companies have reduced the price of fuel oil to 105s. per ton, delivered free in rail or road tank wagons. Vast supplies of fuel oil are now available in the country, and at this price the cost of oil firing is brought below that of coal, even under normal conditions, without taking into consideration the great advantages and economies obtained with liquid fuel. The use of oil fuel is by no means a new venture, but of recent years, owing to the development of improved oil burning systems, it has become a very up-to-date proposition.

One of the most efficient oil burning systems on the market is the Scarab. This, although only introduced some eighteen months ago, is now being used by large and small power users throughout the world. For locomotives, it is very generally accepted, and is now fitted to locomotives on the Great Northern Railway, the North Eastern Railway and the Highland Railway, as well as numerous foreign railways. The Scarab burner is not only suitable for firing locomotives; it can be applied to any size or type of furnace, and has been applied with great success to all kinds of stationary boilers, industrial furnaces, steam wagons, central heating boilers, &c. Owing to the simplicity of the Scarab system, it can be installed in a few hours on any existing boiler, and does not entail any structural alterations.

Some Notes on Insulating Varnishes

By A. R. Matthis, C.E., Ch.E., E.E.*

THE insulating varnishes are products which, besides possessing the usual properties of varnishes, are good electrical insulators. When technical people need insulating varnishes, the firms manufacturing such materials suggest air-drying varnishes and baking varnishes, both being supplied in clear and black colours.

What is the difference between these two kinds of products ?

The first class, the air-drying varnishes, become solid by the evaporation of the solvent, which has given the best suitable consistency.

The second class, the baking varnishes, require, not only the evaporation of the solvent, but an oxidation at a certain temperature. This last condition shows that baking varnishes, to be properly used, have to be treated in special ovens. The ovens are constructed so that a uniform temperature, 208°F. to 212°F. (98°C. to 100°C.), is maintained.

To oxidise the varnish properly, the ventilation of the oven must be good. It would be absolutely impossible to obtain a satisfactory product and sufficient quantities of oxygen without constantly renewing the supply of pure air. This proper ventilation is provided by means of apertures in the lower part of the oven for the ingress of air and vents at the top for the exit of the hot air and the gases constituted by the solvent.

Why are the insulating varnishes used ? Technical people engaged in the manufacture of electric machinery, as well as those using electrical engines, know the hygroscopicity of the principal materials employed in electrotechnical works : the cotton, the paper, &c. They know, too, that the moisture is the most dangerous substance concerning insulation.

The first thing to do is to dry the cotton and paper, when applied on the conductors and the windings. But to prevent the dampness of the atmosphere being fixed again by these materials, it is necessary, if one wants to provide the machinery with an effective insulation, to impregnate with a good insulating varnish. The varnish will, at the same time, protect the machinery against the action of water, acids and oils.

Universal varnish does not exist. There is no varnish which will suffice for all purposes. It would be too expensive to produce varnishes possessing all the properties required in all the cases. The most economical way—and it has been adopted by some of the largest insulating varnishes firms—is to manufacture series of products, each being especially designed to meet special requirements.

The insulating varnishes are used : (1) To prevent the action of moisture ; (2) to increase the insulating properties of the impregnated materials ; (3) to resist the action of oils and acids ; (4) to give better results through their high thermal conductivity ; (5) to form a real "monolithe" with the apparatus impregnated in varnishes (very important for the parts of electrical engines which are submitted to rotations, *e.g.*, rotors of electrical motors) ; (6) because the varnished material keeps its elasticity.

How to Apply Insulating Varnishes

Sometimes the varnishes are applied with brushes, but generally the manufacturers use the dipping process. One of the principal points to be observed in this system is to expel the moisture as much as possible before dipping. If the moisture, which is always present in cotton, is not carefully and completely expelled, the varnish will not be able to penetrate the innermost layers of the windings. The windings will be submitted to a baking for several hours at a temperature of 214°F. to 217°F. (101°C. to 103°C.), to dry the cotton ; upon completion of this baking, the coils will be immediately dipped in the varnish, to prevent reabsorption of moisture and permit of good penetration to prolong the life of the engines.

Following this operation, the coils, thoroughly saturated, will be dripped. They will be simply dried, if the varnish used is an air-drying varnish, or put in an oven (already described) if the varnish is a baking varnish.

The drying and hardening (*i.e.*, evaporation of the solvent and oxidation) will take a certain time—the length of which depends in a great measure upon the quality of the varnish, the depth of the windings, the volume of the coils—to obtain a thoroughly dried varnish even in the interior of the coils.

Generally, after the first drying, a second coating is applied in the same manner, to strengthen the insulation and give a good-looking appearance to the engines.

An important point is the consistency of the varnish. This product containing a certain percentage of solvent will get thicker gradually as the solvent evaporates. It is necessary to use varnishes with a consistency as uniform as possible. In due time thinners will be added to obtain the normal consistency. The solvent will be put slowly and the materials violently stirred to ensure a proper mixture. The tanks containing varnishes should be kept covered when not in use.

Another system, each day more widely used in the important electrical plants, is the vacuum-stove process. The drying is done in a vacuum oven in which the varnish is introduced. The impregnation takes place in vacuum first, to be completed under pressure.

How to Test the Insulating Varnishes

As has been stated in the book, "The Insulating Varnishes," it is quite impossible to indicate definitely the conditions to be observed for the testing of such products.

The testing methods should be carefully adapted to the different uses of the class of varnish. The nature of the test depends upon the kind of varnish and the purposes for which it is to be used. For instance, a varnish that is to be used for the impregnation of transformer coils that operate in mineral oils bath will be tested especially for the action of hot mineral oils.

Other varnishes to be used for the protection of storage-battery terminals for impregnation of electrical motors operating in chemical plants will be tested for their acid-resisting properties, &c. A varnish that is to be used under conditions that require high electric resistance, *e.g.*, for the insulation of high-voltage apparatus, will be strictly tested for their dielectric strength.

The usual tests in general practice are : Determination of the tint, specific gravity, mechanical impurities, viscosity, penetrating properties (special apparatus), volatility ; examination of the solvent, chemical analysis, acidity, &c., determination of the time necessary to dry or to bake the varnish properly, elasticity, resistance to oils, acids, moisture &c., action of heat, thermal conductivity, durability or ageing test, electric test—dielectric strength.

It would take too long to describe the methods used for these tests ; they will be found in the book referred to.

Revarnishing.

Before concluding these notes, a word ought to be said concerning revarnishing. This question is not even now really well understood. A technical man may consider it an investment and not an expense to paint wood, iron or steel in his factory, but will hesitate to take out of service a good running electrical engine to be revarnished. He would be surprised to find the increase in the output and the life of any electrical engine produced by a good revarnishing. Railways would derive great benefit from the varnish habit as well as most motor installations. Of course, all traces of oil, dust, dirt and metallic particles must be carefully removed before revarnishing, which will be the best preventive against breakdowns and will certainly prolong the life of the insulation.

The production of GERMAN DYESTUFFS during 1920 amounted to 145,000 tons, as compared with 135,000 tons ,the pre-war yearly average. In January this year 12,000 tons were produced while in February, the output was 15,000 tons.

* Chief of the Testing Department at the Ateliers des Constructions Electriques de Charleroi. Author of a book recently published, "The Insulating Varnishes."

Paints and Varnishes

Some Exhibits at Olympia

AT the Building Exhibition, held at Olympia, and which closed on Tuesday, there were a number of exhibits of interest to the chemical industry. Paints and varnishes were not so freely exhibited as they might have been in an exhibition of this nature. Panels, Ltd., of 14, Red Lion Square, W.C.1, were showing the "Dieppe" brand paints. These paints, the firm state, are fire, weather, and damp-proof, and are particularly suitable for use in chemical and other works where acid and alkaline fumes are encountered.

At the stand of Cuirass Products, Ltd., of 69, Victoria Street, Westminster, S.W.1, were to be seen a comprehensive range of their Cuirass paints and wood preservatives. The paint is stated to be anti-corrosive, and resists a temperature of 600°F. It is further claimed that it resists atmospheric acids, sulphuric acid, and caustic soda. "Bow Bells" brand paints and varnishes were shown by the Salter Paint Co., of 159, Southampton Row, W.C.1, a feature of the exhibit being their flat oil paint, which, they state, is particularly applicable to cement structures. Paints, dryers, &c., were shown by the Gelesco Paint Co., of Brent Wharf, Brentford, and the Gelatinous White Co., Ltd., of Harefield, Middlesex, had a display of their sanitary distempers.

Lewis Berger & Sons, Ltd., of Homerton, E.9, had a number of preparations applicable in chemical works, including "Sealic," "Durvar" and "Arboreum." Enamels, paints and varnishes were shown by Thos. Parsons & Sons, of 315-317, Oxford Street, W.1, and the stand, representing the deck and bridge of H.M.S. "Endelline," was of an original nature. Walter Carson & Sons, of Battersea, S.W.11, had a display of aluminium paint for ironwork, water and steam pipes, &c. Other paint exhibits were seen at the stands of Aspinall's Enamel, Ltd., of New Cross, S.E.14; British Emaillite Co., Ltd., of Hythe Road, Willesden Junction, N.W.10; and Ottley & Ellson, Ltd., 283, Borough High Street, S.E.1. Sidney Smith & Blyth, Ltd., Lower Grove, Wandsworth, S.W., exhibited their special triple granite roller mills for paints and enamels.

Wood preservatives were represented on the stands of Major & Co., Ltd., of Hull, who were showing their "Solignum" preservative; by C. A. Peters, Ltd., of Derby, and the Atlas Preservative Co., Ltd., of Windmill Lane Wharf, Deptford, S.E.8. The latter displayed specimens of iron and steel coated with their "Atlas Ruskilla," a preservative covering for iron and steelwork exposed to severe oxidising conditions.

The stand of the United Bitumen & Asphalt Supply Co., Ltd., was visited on the opening day by the King and Queen, who evinced interest in the display of Texas and other bitumens, natural asphalt rock, oils, &c. The Limmer & Trinidad Lake Asphalt Co., Ltd., whose offices are at 82, Victoria Street, S.W.1, had samples of their special acid-resisting linings for tanks in chemical works, in addition to specimens of their mineral rock mastic asphalt and Trinidad Lake bitumen for use in various industrial purposes. Paints, varnishes, and damp-proofing compositions were also shown. The Bitumen Products, Ltd., of George Street, Bridgeton, Glasgow, gave demonstrations in the application of an acid-proof roofing compound. Samples of petrol, kerosene, lubricating and heavy black fuel oil produced by the destructive distillation of crude Cuban bitumen were seen at the stand of the Oil Trust, Ltd., of 4, London Wall Buildings, E.C., as well as a Cuban bitumen paint known as "Mariolene."

The Torbay & Dart Paint Co., Ltd., of 26-28, Billiter Street, E.C.3, had an interesting stand at which was shown a powder, known as "Novoid," which is claimed to make concrete impervious to acids, oils and water. The manufacturers state that by its colloidal action it picks up any free lime in the cement and fills the voids with insoluble silicates. An interesting feature of the exhibit was the display of concrete tanks which, it was stated, had contained margarine oils, vegetable oils, ammoniacal tar liquor and sulphuric acid for twelve months.

The internment took place on Tuesday at Acton of Professor Edmond James Mills, D.Sc., LL.D. He was in his 81st year, and had occupied the post of Professor of Technical Chemistry at Glasgow University, and since 1904 had lived in retirement at Acton. Shortly after relinquishing his professorial work he became a Buddhist.

Evaporation and Concentration

Treatment of Salting Solutions

ON April 20, at the Bradford Municipal Technical College, a second lecture on "Evaporation and Concentration" was delivered by Mr. J. Arthur Reavell, of the Kestner Evaporator & Engineering Co., Ltd.

After amplifying the points introduced in the first lecture, Mr. Reavell dealt with the evaporation of liquors containing salts in solution, showing how this difficult problem was dealt with in the latest design of "Salting" type evaporators. In the old-type pan, he said, the whole of the heating surface was contained in the pan itself, but in the modern type certain portions were independent of the separators, thus a section of the heating surface could be washed out or put under repair whilst the remainder was at work.

The lecturer described the method of circulation of the liquor and the way in which the salt was dealt with and extracted by means of a filter box. He showed illustrations of the manner in which dual solutions were handled, in which one of the salts was taken out in the first effect and the other in a second effect. Some interesting slides were shown of large installations of plant erected during the war, both in this country and abroad, for dealing with "salting" solutions, particularly an extensive installation in connexion with the fixation of atmospheric nitrogen. Mr. Reavell produced data in support of his observations and gave figures showing economies to be obtained by multiple effect evaporation as against ordinary pans or boats, using steam coils or jackets. He also gave comparative figures of boiling in open pans requiring an equivalent of 18 tons of coal: single-effect evaporation where the waste heat was utilised in heating the incoming liquor which reduced the coal consumption to 15 tons, and triple-effect which again reduced the figure to 6½ tons; these figures being based on the evaporation of 100 tons of water under the same conditions in each case.

The lecturer than gave particulars of the use of waste steam by compressing it to a higher pressure. This, he said, could be done either by direct-acting compressors, particulars of which he gave, or by a simple device known as the Kestner injector compressor, in which live steam at high pressure was used to mix with the low-pressure steam, so as to give steam at an intermediate pressure which was available for heating or evaporating purposes.

In the illustrations given it was shown that by an apparatus of this kind it was possible to raise 100 tons of water from 15°C. and evaporate it with the consumption of only 7 tons of coal. The "Cascade" type of concentrator, for use in concentrating acids, was described in detail and figures given of the economies obtained.

In conclusion, Mr. Reavell gave details of the use of film evaporators where very low temperature drops only were available, and some interesting particulars were given of the way in which volcanic vapours could be used in steam turbines after first having passed through a film evaporator.

Catalogues Received

WE have received from Herbert Morris, Ltd., of Empress Works, Loughborough, an attractive booklet, describing and illustrating the uses of their patented elevating trucks. These trucks are made in light and heavy types, the former being suitable for loads up to 10 cwt. Their qualities are summarised by the firm in the phrase: "Puts your floor on roller-bearings; your factory on wheels."

H. K. Lewis & Co., Ltd., of 136, Gower Street, and 28, Gower Place, W.C. 1, send us a 68 page Supplement (1918-1920) to the Catalogue of Lewis's Medical and Scientific Circulating Library, with a list of additions to March, 1921. The list is arranged alphabetically under authors' names, and is supplemented by a subject index. Works on analytical, applied, inorganic, organic, physical and physiological chemistry, coal tars, colloids, dyes and dyeing, and fertilisers are included. The catalogue is obtainable from the publishers at 1s. net.

Lactocal, Ltd., Lactocal Works, Stockwell, S.W. 4, forward a sample of their cold water glue in powder form, which, when set, is stated to be insoluble in water, makes a watertight joint, and is unaffected by heat. Its strength under tests has been proved to be over 1,000 lb. per square inch. The whole of the firm's output during the war was taken by the Government for Class 1 aircraft construction.

Reviews

ANALYSIS OF PAINT VEHICLES, JAPANS AND VARNISHES, by C. D. Holley, Ph.D. London: Chapman & Hall. Pp. 203. 13s. 6d. net.

The author of this book is professor of chemical engineering in the University of Michigan, and chief chemist of the Acme white lead and colour works. He deals with the methods applied in connection with the analysis of the vehicles used in the manufacture of paints and varnishes rather than with actual manufacturing operations, and many of the methods he describes are the results of extended investigation conducted by himself and his associates, and have now been adopted as standard methods by the American Society for Testing Materials. There can be no question that great advances have been made in the paint industry during the last few years, the employment of thoroughly trained technical men has had its results, and vehicles are made use of to-day which were at one time unknown or considered unsuitable. As an example, may be quoted the case of petroleum thinners. In the distillation of these one has to deal with a solvent composed of a large number of compounds or series of compounds, the members of which so closely resemble one another in physical and chemical properties that absolute differentiation by a simple means is extremely difficult. At the same time the chemist must be armed with a method of analysis which, while being thoroughly dependable, must not appropriate an undue proportion of his time.

Perhaps, in paint manufacture, the most important vehicle is linseed oil, and the author points out that although this oil may be characterised as pure its quality may nevertheless be quite unsuitable for the purpose it is destined to fulfil. While, however, it is possible to control the purity of linseed oil by buying direct from the producer, the same cannot be said of other materials, such as tung oil, as in such cases the oil will usually have passed through several hands before it reaches the consumer. Tung oil, in fact, appears to present particular difficulties so far as analysis is concerned, for on account of the fact that a very small percentage adulteration seriously affects its working qualities the ordinary chemical constants cannot be relied upon in determining its purity and suitability for use. For instance, the author mentions the fact that he has tested numerous shipments that have been passed as pure by skilled analysts, and he has found them to contain adulterants. It is, of course, the heavy demands for linseed oil within the past few years which has forced the paint manufacturer to look round for substitutes; and, although the latter are by no means lacking in numbers, the question as to their employment mainly depends upon whether or not they can be obtained commercially in sufficient quantity to meet the industrial demand. Perhaps, of all the substitutes suggested, soya oil has proved the most satisfactory and adaptable. With a growing tendency towards the use of substitutes, however, it is of primary importance that the consumer should be able to confirm or refute the suitability of the materials supplied to him. Dr. Holley, in a concise and accessible manner, shows how this may be done, and for this reason his handbook should be of particular service in every paint work's laboratory. C. A.

RED LEAD: HOW TO USE IT IN PAINT. By Dr. A. H. Sabin. New York: J. Wiley & Sons. London: Chapman & Hall, Ltd., 1920. (Third Edition.) Pp. 139. 11s. 6d. net.

Although described as a third edition, Dr. Sabin's little book is to all intents and purposes a first edition, as the first two editions were published and circulated privately by the author. In view of the fact that there is very little literature dealing with the uses of red lead in paint, and that the preservation of metal structures is an increasingly important consideration in chemical industry, the present edition, which has been rewritten and amplified to a considerable extent, should be a useful addition to the bibliography of paints. Objections to red lead on the ground of coarseness are now less regularly advanced, owing to the prolonged dry grinding to which the litharge is generally subjected. The introduction of red lead in paste form did much in the way of increasing its availability for more extensive use, and the author in his prefatory note, predicts its sale as a liquid paint ready for use. Dr. Sabin disposes of the suggestion that lead paints should not be used in oil refineries on account of the sulphur contents of crude oil. If there is sulphur in the oil it is in chemical combination, and can only be separated from it by chemical treatment.

While the size of the book prevents any very extensive treatment of the subject, portions are devoted to the relation of lead pigments to oil, the theory of inhibition, the testing of red lead paints, paint calculations and volume proportion. There are two appendices, the first giving the standard method of testing red-lead adopted by the American Society of Testing Materials. Appendix II gives specifications for the painting of gas holders, bridges, water tanks and other structures. B.C.H.

LES VERNIS (VARNISHES). Ch. Coffignier. Paris: J. B Baillière et Fils. Pp. 640. 40 francs.

MM. Ballière have in preparation a series of *Grands Encyclopédies Industrielles* designed to bridge the gap between science and industry. The Great War, they point out, brought together the man of science and the manufacturer, and the resulting interchange of ideas, they consider, renders the moment favourable for the production of encyclopedias in which both the theoretical and practical sides of the subjects dealt with will be set out. The present volume is the first part to appear of the *Encyclopédie de Chimie Industrielle*, a work of 52 parts under the general editorship of Professor Matignon.

Professor Haller contributes a preface in which he observes that the varnish industry has always lived in a traditional empiricism, due primarily to the unconcealed disdain of the manufacturers for scientific methods, and secondarily to the scantiness of our knowledge of the chemical nature of the resins which form the raw materials of the art. He pays a tribute to the author as one who has consistently striven to remedy this state of affairs.

The work itself mainly falls under two heads, one dealing with the raw materials (resins, oils, solvents, &c.), and the other with the varnishes themselves. After a historical introduction, Chapter I. discusses the resins, oleo-resins, and balsams. The author steers his way in masterly fashion through the bewildering variety of copals, dammars, &c.; for characterising these he uses the results of his own extensive researches on their solubilities in organic solvents. The section devoted to synthetic resins is less happy, and suggests a somewhat hasty compilation from the patent literature, a suggestion which is heightened by numerous mis-spellings. (Backland for Baekeland, Baeyer for Bayer, Birend for Berend, and so on.)

Chapters II. to VI. deal with resin esters, solubilized resins, asphalts, colouring matters, the general properties of resins, analytical methods and commercial statistics, and the metallic resinates and linoleates. It seems rather unnecessary in Chapter III. to devote a page to the constitution and synthesis of indigo, while the other "aniline colours" are dismissed in a paragraph.

A lengthy Chapter VII. surveys the solvents used in the industry, the treatment of linseed oil and turpentine spirit, as befits their importance, being particularly full. The second part contains four chapters on the oil varnishes, dealt with in the same authoritative fashion as the resins. Briefer chapters follow on turpentine varnishes, spirit varnishes, and various miscellaneous varnishes, including japans. The allocation of space to the nitrocellulose varnishes and cellulose acetate varnishes and "dopes" is not, we think, commensurate with the importance of these subjects. An appendix deals briefly with linoleum, oil-cloth, &c., and statistics. The four-page index might with advantage have been fuller.

On the whole, however, the author has carried out a difficult task in a manner which compels our admiration. The style of the book is clear and concise, the treatment methodical and scientific, and the matter informative without being overloaded with detail. The work will undoubtedly rank as one of the most considerable which has appeared on this branch of chemical technology. T. B.

The British Chemical Ware Manufacturers' Association have sent samples of British made electric light bulbs to members of Parliament with a view to showing the superiority of United Kingdom manufactures.

Condition of British Trade

To the Editor of THE CHEMICAL AGE.

SIR,—Prior to 1914 chemicals and dyestuffs served as a barometer in relation to the textile trades of the United Kingdom. If the scale of relative figures was then 28 to 31 the indicator would stand at about 30·5 at the time the Great War began. To-day the mercury would have disappeared altogether, and if it could by any means be tabulated, a figure of about 03·5 might be the approximately correct reading. Nowhere in living memory could a parallel be found for present conditions. Most of the works using chemicals and dyestuffs are closed down, and the remainder are on short time. In periods of depression formerly there was always sectional activity. Cotton and silk might be quiet, and woollen and worsted fairly active or *vice versa*. Home trade demand might have been slow, but export business brisk. Now all alike are stagnant, and chemicals and dyestuffs for the time being are almost unsaleable. Why?

The aftermath of war inevitably includes severe trade depression, and it is not surprising that the greatest war in history should be followed by the greatest dislocation of trade and finance ever known. This could and should have been foreseen, and the Board of Trade might properly have concentrated their attention upon devising ways and means for alleviating and, as far as possible, minimising the anticipated bad trade conditions. Unfortunately the Government policy with regard to trade has in effect intensified difficulties. Just when the chief needs are to give every possible encouragement to a steady approximation to normal conditions, and to bringing urgent needs for commodities into practical connection with existing stocks urgently awaiting realisation, exclusions, restrictions, delays and penalties are introduced leading to the diversion from instead of the attraction to the United Kingdom of great volumes of trade.

The German Reparation (Recovery) Act in operation imposes a fine of 100 per cent. upon the British consumer upon goods that he must buy from Germany, as they are not available from any other source, and he has the poor consolation of knowing that this 100 per cent. is a contribution by him towards the payment of the indemnity that Germany should pay.

The Dyestuffs Act hurriedly passed a few months ago has so far accomplished no good, and has done a vast amount of harm.

The Ways and Means Resolutions regarding Key Industries, Anti-Dumping and abnormal exchanges will, if applied, further fetter, restrict, and penalise.

The present writer has before him a letter from an important firm in Holland in which it is stated: "At the moment we are very busy in our export department, and therefore must ask you to be patient for another day or two," indicating that they are so busy that they cannot attend to enquiries for quotations, &c. This is significant and typical. Many instances could be quoted of detriment sustained and business thwarted by the restrictions and the lack of freedom to trade, but just now the following example must suffice. Among the articles which, under the Dyestuffs Act, cannot be imported into the United Kingdom is synthetic indigo. This article is very largely used for dyeing and printing. British consumers are paying a price that is to-day fully 25 per cent. more than British merchants are quoting for direct shipment from the Continent, delivered c.i.f. Far Eastern or U.S.A. Ports. This means that whilst offers cannot be made by British merchants for consumption in the United Kingdom, they can quote and sell to the Japanese, Chinese, Indian or American competitors of the British manufacturers and calico printers at 25 per cent. less than the British users are paying! Is this to be continued, tolerated, and perpetuated?

A familiar sign at an Inn near by where there used to be a toll bar, intimates:

"This gate hangs free and hinders none,
Refresh yourselves and travel on."

It will be a happier day, and there will be a brighter prospect, when London, Liverpool, Manchester, and our other ports can claim:—

"This port is free and hinders none,
Goods for goods with profits on."

Yours, etc.,

Manchester, April 25. FREDK. T. T. REYNOLDS.

Jerusalem University Library

To the Editor of THE CHEMICAL AGE

SIR,—At the third annual conference of the Inter-University Jewish Federation held at Oriel College, Oxford, on August 3, 1920, it was unanimously resolved, in response to a request of the Zionist Organisation, to render every possible assistance to all efforts on behalf of the Hebrew University at Jerusalem. The most urgent need at the present juncture is an immediate and abundant supply of books for the Jerusalem University Library. Serious works dealing with all branches of knowledge, standard works of fiction in any language, and more especially books which will be of use to University students are needed. Books on Hebraica, Judaica and Semitica, Mathematics, Physics, Chemistry, Microbiology and Medical research are, however, the most urgently called for, as the first departments of the University that are to be opened will deal in research in these subjects. Books on Law, Economics, History and Philosophy will also be much appreciated. Sets of Scientific Journals, Transactions of Learned Societies, Official Reports and other publications and works and pamphlets of permanent value are especially required; good text-books of established repute will also be useful. A single book will be welcome; but it is hoped that donors will send as many as they can. Gifts of books may be sent either direct to "The University Library, Jerusalem" or to the hon. secretary, Mr. D. B. Stanhill, B.Sc., F.I.C., 75, Great Russell Street, London, W.C. 1, who will, if necessary, arrange for the collection of the books. An artistically designed bookplate, the generous work of Mrs. L. Pilichowski (Lena Pillico) will permanently record the names of the donors,—Yours, etc.,

S. ALEXANDER, *Chairman.*
ISRAEL M. SIEFF, *Treasurer.*
D. B. STANHILL, *Hon. Secretary.*
April 21. HARRY DAGUT, *Chairman, I.U.J.F.*

British Empire Chamber of Commerce

To the Editor of THE CHEMICAL AGE

SIR,—We desire to call your attention to the formation of the British Empire Chamber of Commerce in the United States of America and enclose pamphlet which gives a short account of the organisation and its purposes. Under separate cover we are mailing you a copy of the first issue of our monthly journal. This is mainly an account of the institutional meeting on January 26, but it is intended that subsequent numbers shall contain information of trade value. We shall be glad to put you on our regular mailing list if you desire it, and in return shall appreciate it if you will send us your publication, THE CHEMICAL AGE. Assuring you of our desire to co-operate with you.—We are, &c.

BRITISH EMPIRE CHAMBER OF COMMERCE IN THE UNITED STATES OF AMERICA.
165, Broadway, New York. F. W. G. HALE.
April 12, 1921.

Photography of Coloured Objects

IN connexion with the visit to Newcastle of Sir William Pope, a meeting was arranged in Armstrong College, at which he delivered an address to the chemical students. The lecture hall was packed to its utmost capacity, and the lecture was greatly appreciated by the principals and students. Sir William took for his subject the photography of coloured objects, and by means of slides he was able to demonstrate how very far we had made progress in that art. Nearly 100 slides were shown, and the various processes were explained. Considerable interest was taken in the exhibition of coloured slides made 40 years ago, by Joly, of Dublin. Sir William also made interesting references to the part played by photography in rendering the R.A.F. one of the most efficient arms of the Service during the war.

A lecture on "PAPER PULP SUPPLIES FROM INDIA," by Mr. W. Raitt, F.C.S., cellulose expert to the Government of India, will be given before the Royal Society of Arts on May 3. Mr. R. W. Sindall, F.C.S., who, at the instance of the Indian authorities, carried out in Burma an extensive investigation of bamboo for paper making, will take part in the proceedings. The chair will be taken by Sir Robert W. Carlyle.

Pure Hydrogen and Hydrogenation of Oils

Recent Methods Reviewed by Dr. Maxted

In a paper read before the Birmingham and Midland Section of the Society of Chemical Industry, held at Birmingham University on April 14, Dr. E. B. Maxted (Walsall) discussed the question of "The Manufacture of Pure Hydrogen and the Catalytic Hydrogenation of Oils." Dr. H. W. Brownsdon presided over a representative attendance.

Methods of Generating Hydrogen

Dr. Maxted referred to the fact that there were four methods by which hydrogen, suitable for use in catalytic processes, was generated industrially. The first was by the electrolysis of aqueous solutions; the second, by the low temperature separation of the constituents of water gas; the third, by the catalytic water gas process, involving the replacement of carbon monoxide by hydrogen by reaction with steam in the presence of a catalyst; and the fourth, by the cyclic water gas process, in which the replacement of carbon monoxide by hydrogen was carried out in two separated phases.

Of these, the first and last gave under suitable operating conditions a gas sufficiently free from inhibitants to be used directly for catalytic work, while the gas from the second and third methods required, for most purposes, to be freed from a small percentage of carbon monoxide by a process of final purification. The applicability of one or another of the above types of process would be determined both by the nature of the catalytic operation itself and by the conditions of environment. Thus, while, under normal conditions, coke and steam constituted the most economical raw materials for the production of hydrogen, it would be readily understood that the availability of cheap water power might well cause the balance of economy to swing towards an electrolytic method, this being especially the case if a profitable outlet existed for the oxygen simultaneously produced, or if the hydrogen were obtained as a by-product of another industry, such as the electrolytic manufacture of caustic soda.

The first stage in the production of hydrogen by any of the processes employing coke as a raw material consisted in the conversion of this into water gas or into a gas of somewhat similar composition. The economical transformation of this water gas into hydrogen containing a small percentage of carbon monoxide, or of carbon monoxide and nitrogen, either by the catalytic method or by low temperature separation, together with the subsequent removal of these impurities, had become a manufacturing process of the highest technical importance, particularly in connexion with the synthesis of ammonia. For the production of hydrogen for purposes such as the hardening of oils it was, as a rule, desirable to install a plant which would economically produce a gas of a high degree of purity, directly and without a complicated process of final purification. For this reason, the cyclic water gas method is particularly suitable.

Hydrogen Produced by Cyclic Processes

Discussing the question of hydrogen production by the cyclic process in its ordinary form, Dr. Maxted explained that the hydrogen was found to contain a small percentage of carbon monoxide, which did not originate from the residue of reducing gas left in the retorts from the reduction phase, but was produced, on the other hand, continuously during the steaming period and consequently could not be eliminated by increasing the time of rinsing. This carbon monoxide arose from a secondary reaction which took place during the reducing period, when the contact mass, in addition to becoming reduced, caused the catalytic decomposition of the carbon monoxide contained in the water gas employed, according to the equation $2CO=CO_2+C$. The carbon deposited persisted into the steaming phase, where it reacted thus: $C+H_2O=CO+H_2$, carbon monoxide being thus generated simultaneously with the main production of hydrogen by the action of steam on the reduced iron.

This deposition of carbon, which was the *bête noire* of the cyclic process, mightb e prevented in a very simple manner by varying the composition of the gac used for reduction. The undesired reaction,

$$2CO \rightleftarrows CO_2+C,$$

being reversible, corresponded to the well-known water gas equilibrium reaction, and did not take place in the sense from left to right in the reversible equation, if the reducing gas contained carbon dioxide in amount in excess of the equilibrium percentage this percentage depending on the minimum temperature of reduction employed, and on the partial pressure of the carbon dioxide and monoxide in the reducing gas.

Thus, a simple solution of the difficulty was effected by using, in place of ordinary water gas, a gas somewhat richer in carbon dioxide, such as was obtained by installing a water gas producer constructed for operating at an abnormally low temperature. The velocity of reaction between coke and steam was, of course, less at low temperatures, and, since the coke was thus gasified more slowly, a larger producer was required to maintain a given output of reducing gas.

"Hardening" of Oils

As to the so-called "hardening" of oils Dr. Maxted observed that this consisted in the saturation with hydrogen of the ethylenic linkages of various naturally occurring glycerides. These natural oils, particularly in view of the tribasic character of glycerine and the consequent possibility of the formation of mixed glycerides, possessed a highly complex composition, the principal acid groups consisting, however, of compounds which, when hydrogenated, passed into stearic acid. Of these acids, four, namely: oleic acid, linolic acid, linolenic acid and clupanodonic acid, were of special importance. An unsaturated hydroxy-acid—ricinoleic acid—was, further, contained in castor oil. The method of hydrogenation usually employed consisted in heating the oil to the desired reaction temperature, and after the introduction of an amount of catalyst which, in the case of nickel, might vary from 0.25 to 1 per cent. of the weight of the oil, agitating violently in an atmosphere of hydrogen, the absorption of the gas being allowed to proceed until the required degree of hardness had been obtained.

The course of the absorption of hydrogen at a given temperature was formerly thought to follow the unimolecular reaction law $\frac{dv}{dT}=k(a-v)$, in which a was the original hydrogen value of the charge of oil treated, and v the volume of hydrogen absorbed after time t, but it has recently been shown by Armstrong and Hilditch that the gradual diminution in the velocity of absorption of hydrogen as saturation proceeded was not obtained with bodies which were completely free from inhibitants, the true reaction curve following the linear equation $\frac{DV}{DT}=KA$ up to a point in the neighbourhood of complete saturation, when the rate of absorption of hydrogen, which had hitherto been constant, quickly dropped to zero.

This result was of considerable theoretical importance, in that it seemed to indicate that the real reacting system consisted of a complex in which the concentration of the unsaturated body was constant as long as a supply of this was available. In practice, however, with oils of ordinary purity, non-linear reaction curves were obtained, and the activity of the catalyst was found to be decreased on employing it for a fresh charge of oil. In many of the earlier plants, particularly those in which nickel oxide was used in place of nickel, a relatively high reaction temperature (200—250°C.) was employed. It had, however, now long been recognised that relatively high temperatures exerted a disadvantageous influence both on the quality of the product and on the speed of reaction. The optimum working temperature would depend to a large degree on the nature of the nickel catalyst employed, and on the oil to be treated, particularly in view of the fact that certain of the catalyst poisons appeared to be less toxic at high temperatures, this factor tending to compensate for the decreased reaction velocity due to a temperature above the optimum point.

At relatively low temperatures, with pure substances, the activity of the catalyst usually increased somewhat after it had been used for a short time, this effect being probably due to the catalytic reduction of the unreduced and catalytically inert nickel oxide usually contained in nickel catalysts, by which means the content of nickel in its active form was increased. The temperature of maximum activity was about 175°C., and

the velocity of reaction was appreciable even at 80°, while at 100°C. it was sufficient for this temperature to be used for efficient hardening; but the employment of temperatures in the region of 100°C. was only possible with relatively pure oils. With most oils, of average commercial quality, a somewhat higher reaction temperature was rendered necessary by the catalyst poisons of various kinds already contained in the oil itself, and the author observed that it is his ordinary practice to begin hardening at about 120—130°C., the temperature rising subsequently, by virtue of the heat of reaction, to a maximum of about 160°C. From manometer readings at various intervals, it was easily possible to calculate the progress of absorption with the time.

Apart from their use in soap and candles, as stearine substitutes, hardened oils were becoming of an increasing importance as edible fats. Such products were, of course, sterile and it was possible, even from an inferior oil, to prepare a white fat of good appearance, and, at any rate after subsequent treatment and blending, of good taste. Hardened oils formed probably the first instance of a widely-used synthetic food.

A discussion ensued.

Society of Dyers and Colorists

Manchester Section

THE Annual Meeting of the Manchester Section of the Society of Dyers and Colourists was held in the Lecture Room of the Manchester Literary and Philosophical Society on April 22, Professor Knecht presiding.

The Hon. Secretary (Mr. J. Campbell Gray) presented the Annual Report for the past year and its adoption was unanimously confirmed. A ballot was taken for the purpose of electing the members of the Sectional Committee, with the result that Miss Hibbert, Professor Knecht, Messrs. Marshall, Pennington, Vlies, Holden, Hannay, Schofield, Gray, Thompson, Livesey and Radcliffe were appointed.

Tinctorial Value of Mauve

Delivering a "Note on the Tinctorial Value of a Sample of Mauve made about the year 1864," Miss Eva Hibbert stated that although Perkin's discovery of mauve in 1856 was well known as marking the beginning of a new era in textile colouring, it was safe to assume that few people had seen the actual dyestuff or even specimens of fabric dyed with the first so-called aniline dye. Having this in mind, the Society caused, on the occasion of the Perkin jubilee in 1906, a small sample of silk dyed with some of the colouring matter made by Perkin at his works at Greenford Green, in 1863 or 1864, to be inserted in the *Journal* along with a short explanatory note.

A sample of the same dyestuff being in the possession of Professor Knecht, Miss Hibbert had undertaken to ascertain the tinctorial strength by titration with titanous chloride. The sample in question dissolved in water with an intense red-violet colour which was readily decolourised by excess of titanous chloride, giving a sharp end-reaction. The original colour at once re-appeared on exposure to the air.

The amount of colour found was 80 per cent., moisture 16·1 per cent., total 96·1 per cent. The dyestuff was a sulphate: $C_{27}H_{24}N_4(SO_4)\frac{1}{2}$. The strength and purity of the dyestuff as made nearly 60 years ago was remarkably good, and both gave testimony to the manufacturing skill of the great inventor, comparing favourably with the best modern productions and completely outclassing many others.

Mr. PENNINGTON stated that in 1869 he was using Perkin's mauve under the name of lilac, it being about one of the eleven aniline colours of the time. It would be interesting to compare the modern product with the old one, and he hoped that Miss Hibbert would see fit to pursue her investigations further. He believed Meister, Lucius & Brüning produced a product which was almost exactly the Perkin's mauve, possibly methylene heliotrope.

Dyeing Artificial Silk

Miss HIBBERT mentioned that she had made an examination with methylene heliotrope and obtained a shade rather redder than the one under consideration, though the colour value was not so high. It was a German production. With the Perkin's mauve the patterns appeared to look a little bluer in daylight than in electric light, and altogether their appearance was superior in natural as contrasted with artificial light.

Professor KNECHT stated that the term Tyrian purple was the name originally given to mauve, the latter being a name created by the French and afterwards adopted by Perkin.

Mr. MARSHALL said he had tried the effect of Perkin's mauve on artificial silk, and exhibited a dyed sample of acetyl-cellulose silk, concerning which statements had been made that it would not dye at all. The shade obtained by the use of this sixty-years old dye was very good. The bath was slightly acid.

Replying to Mr. VLIES, who asked on what evidence the lecturer said she believed Perkin's mauve was a half-sulphate, Miss HIBBERT said she had only a very small amount of material to work on, but had found no chlorine present, and therefore concluded it must be a sulphate.

Some Laboratory Notes

Under the above title, Professor E. Knecht, Ph.D., continued a synopsis of some work first mentioned at the commencement of the Session. One of the points dealt with was the use of titanous chloride for the production of diazo compounds. When titanous chloride was allowed to act on nitric acid it readily brought about the reduction to nitrous acid, two equivalents of titanous chloride being sufficient for one molecule of nitric acid. If this reaction was conducted in the presence of a primary aromatic amine then diazotisation ensued, which, in one case, was proved to be of a quantitative character. The reaction was one which in his (Professor Knecht's) opinion might find some application on account of its relatively slow action.

A New Reaction

In the ordinary process of diazotising, by adding nitrate of soda to a solution of an amine in hydrochloric acid, there was a very pronounced rise in temperature and this had to be guarded against by the use of ice or other artificial refrigeration. In the case of the new reaction the rise in temperature was not noticeable, and this was probably the reason why certain results had been attained which were not obtained by the ordinary reaction.

The whole question was still under examination, but two samples had been prepared recently by Mr. Daymsick, using the new reaction. One was a sample of chemically pure chrysoidine which was prepared in the ordinary way from aniline nitrate to which two equivalents of titanous chloride were added. This was combined with the phenylenediamine in the presence of sodium acetate. Another reaction of a different type had been attempted in the way of producing a nitroso compound, and nitroso-dimethylamine had been chosen as an example. By adding the titanous chloride to a solution of dimethylaniline nitrate, in water, the reaction was found to take place.

Mr. HANNAY enquired whether there had been a trial of the reaction for bringing about diazotisation for immediate coupling on the fibre, and, if so, whether the titanium solution interfered in any way with the coupling with the shade obtained, say, for instance, a diazotisation of p. nitraniline.

Professor KNECHT said that the titanium was no respecter of nitro-groups and consequently it had not been possible to diazotise the p. nitraniline up to the present. He also stated that further experiments had been made in collaboration with Mr. F. P. Thompson on the characteristics of highly oxidised cellulose, with special reference to its behaviour towards p. nitrophenyl-hydrazine and the changes which were brought about in its behaviour towards colouring matters by various chemical treatments.

Mr. THOMPSON showed a specimen of methyl-cellulose, made according to the directions of Mr. Denham, in the oxidised condition. This specimen showed an increased affinity for methylene blue as compared with the unoxidised methyl-cellulose

An extensive DEPOSIT OF JAROSITE has been discovered near Anglesea, Victoria. Jarosite is a basic sulphate of iron and potassium, and in composition corresponds to mineral alunite.

Society of Chemical Industry

Annual Dinner of Newcastle Section

THE annual dinner of the Newcastle section of the Society of Chemical Industry was held in the Station Hotel, Newcastle-on-Tyne, on April 22. Dr. J. H. Paterson, the local chairman, presided, and amongst the guests were: Sir William J. Pope, Dr. J. H. Paterson, Councillor T. W. Rowe, Mr. A. E. Doxford, Mr. G. Vardy, Dr. J. P. Longstaff, Dr. J. T. Dunn, Mr. C. J. R. Stock, Professor P. P. Bedson, Professor W. N. Haworth, Professor Henry Louis, Dr. F. C. Garrett, Dr. Henry Peile, Mr. Francis Priestman, Dr. J. A. Smythe, Dr. G. Weyman, Mr. E. Morley Fletcher, Dr. A. Fleck, and Mr. A. Trobridge.

The first toast of the evening, "The Society of Chemical Industry," coupled with the name of Sir William Pope, the President, the guest of honour, was proposed by the Chairman. They had, he said, every right to be proud of their society, which was one of the most important technical societies in the country, although not the strongest numerically. They were proud of the published works of the Society and, in his opinion, they published one of the most advanced and best-arranged technical journals in the world, even though it had come in for a good deal of criticism. He thought, too, they were entitled to be proud of having Sir William Pope as their President. The work of Sir William Pope was known and appreciated far beyond the ranks of their own members, and he believed his work was indelibly written on the pages of scientific progress. He mentioned the fact that a large number of representatives from other important societies were present and it was a great pleasure to him to welcome them.

Sir William Pope

Sir William POPE, responding, said he had always found it difficult to understand how they selected their Presidents in the Society of Chemical Industry. Sometimes they selected a man who was known for his high technical attainments in the world of chemistry and sometimes a man who, though not a technical man in the ordinary sense, had rendered great service to the science of industrial chemistry. Why they had chosen him he could not say—unless it was for his personal beauty. He was of opinion that there had never been the full sympathy between the men representing pure chemistry and those representing applied chemistry that there should have been, but he thought things were changing and they were beginning to walk hand in hand in a way which was not thought possible in the past. The Newcastle Section was one of the mainstays of the Society. It had furnished some great Presidents, amongst whom he would mention Swan, and Professor Louis, who was still with them.

When he first became actively associated with the Society of Chemical Industry he was somewhat perturbed. There was a great deal of criticism of various actions taken by the Council, but gradually he realised that it was a good thing. He belonged to a number of technical societies and he could roughly divide them into two sorts. There were the societies in which no one thought of being so rude as to criticise; all such societies were in a decadent condition. There were other societies in which there was friction, or, at least, a generating of heat. The members talked of the sinister motives of all sorts of people, and the speakers generally suggested that they could do a great deal better than the people who were doing the work. All that criticism, however, really meant that the society was alive, that something was going on, and that things were constantly improving; he placed the S.C.I. in the latter category.

They heard from some quarters that the Society's journal was, to say the least, a rotten publication, but to-night they had heard Dr. Paterson describe it as one of the foremost in the world; he agreed with the Chairman.

The Canadian Visit

Sir William then referred to the fact that the annual meeting was to be held in Canada this year. He understood that the Canadian members were making lavish preparations and intended giving them every opportunity of seeing what was being done in Canadian chemical industry. He appealed to the section—and to every section—to send as many members over as possible. He felt sure that if any member fell out of the trip to Canada he would regret it for the rest of his days. The Canadian chemists had obtained a good deal of information regarding chemical industry in this country during the war, and the British chemists had now the opportunity of reciprocating. He put it to them as an exhortation from the Council to send as many members as possible to Canada this year. He thanked them for the toast of the Society and for the hearty way in which they had received him as its representative.

Professor BEDSON moved the toast of the Lord Mayor of Newcastle (Coun. T. W. Rowe). He referred to the past work of the Tyneside in the development of chemical industry, and said that it was fitting that the first citizen of Newcastle should honour them with his presence at that gathering. It was interesting to observe that one of the most eminent presidents of that society, Sir Lothian Bell, was an alderman and mayor of Newcastle.

Replying, the LORD MAYOR said he hoped that in "analysing" his speech—as all the gentlemen present could very ably do—they would find the good wishes of the City towards chemical industry within it. It was extremely gratifying to know that one of the first societies of the kind was formed on Tyneside. He agreed that Sir Lothian Bell was one of the most eminent scientific men of the day, and he would be long remembered not only for that, but for his great public services. He admitted that he, personally, knew but little of the technical work of the members of the Society of Chemical Industry, but he did appreciate the great work they had done in building up the industries of the nation. He assured them, also, that if they needed assistance as a society the City of Newcastle would always come to their aid. He felt he could truthfully say that the importance of scientific research was recognised in Newcastle, perhaps, to a greater extent than in any other city.

Interdependence of Technical Societies

Professor LOUIS proposed the toast of the guests. He referred to the number of kindred technical societies which they represented. It was a source of satisfaction to him that they had attended. It strengthened the link between them, which was already being forged by the interdependence of their work. The *Transactions* of the Society of Chemical Industry were rich in papers of value to shipbuilders, foundrymen and engineers. In the coal trade, too, the development of the by-product industries had made colliery managers and owners realise the importance and necessity of fostering the science of chemical industry. It was true that this was an age of specialisation, but at the same time whatever industry a man was engaged in he should have some knowledge of others. He did not say that they should have the profound knowledge of the men actually engaged in the industries, but they should, at least, have some working knowledge of other industries.

In the broadest sense of the word he considered they were all engineers in the sense of applying science to industry, and utilising the raw material and energy provided by nature for the benefit of the community. That was his broad conception of an engineer and his work, and they all came under that heading. The presence of so many distinguished men of other societies amongst them proved that the interest in the work of the chemist was growing, and he heartily welcomed them.

Mr. A. E. DOXFORD (President of the North East Coast Institute of Shipbuilders and Engineers) briefly responded. He agreed with Professor Louis that men of all technical societies should have frequent intercourse with each other—nothing but good could come of it. He for one cordially appreciated the work of the Society of Chemical Industry. He was afraid, however, that the general public did not fully appreciate its work or the work of other technical societies. It was beoming increasingly difficult for them to carry on. He felt that if every so-called hard-headed business man really appreciated the work of the technical societies they would get on much better.

Armstrong College

Dr. LONGSTAFF proposed the toast "Armstrong College," and referred to the long and honourable connexion with the college of Professor P. P. Bedson, who had always been one of the most valuable supporters of the Society of Chemical Industry. Although not in direct contact with the college, he knew, as secretary of the Society, how much they owed to it in making the Newcastle Section one of the most powerful in the country.

Professor W. N. HAWORTH responded on behalf of the College. He, too, referred to the impending retirement of Professor Bedson with regret. Though he had not been at the College

very long he felt sure that there was no educational centre in the country which could compare with the Armstrong College for the way in which an intimate connexion between applied and pure science had been kept up. When one knew the personnel of the Newcastle Section (there were, for instance, twenty old students present at that dinner) they could easily understand why Armstrong College had been included on the toast list that evening. He thanked them on behalf of the College.

Dr. F. C. GARRETT proposed the health of Mr. H. Dunford Smith, the secretary, and Mr. A. Trobridge, the hon. treasurer. Mr. Trobridge replied for both in the absence of Mr. Dunford Smith, who is recovering from a serious illness. It was unanimously decided to send a message of greeting to Mr. Smith from the gathering.

Election of Officers

At the annual meeting of the section, which preceded the dinner, the following officers and committee were elected for the ensuing year: *Chairman:* J. H. Paterson; *Vice-Chairman:* P. P. Bedson; *Treasurer:* A. Trobridge: *Secretary:* H. Dunford Smith; *Committee:* P. E. Bowles, W. Diamond, J. T. Dunn, F. C. Garratt, F. Hirsch, D. W. Jones, H. Louis, H. Peile, A. Short, F. H. Walker and G. Weyman.

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Professor F. G. Hopkins, F.R.S., who is at the present time lecturing in the United States, has been elected into the newly-established Sir William Dunn PROFESSORSHIP OF BIOCHEMISTRY in the University of Cambridge.

Work of the Public Analyst

The Need of Central Official Laboratories

AT a meeting of the Nottingham Section of the Society of Chemical Industry, held on Wednesday, April 13, Mr. S. F. Burford, F.I.C., gave an interesting informal account of the work of the Public Analyst. The great variety of knowledge and experience required, both chemical and legal, he said, made his profession one of the most difficult. The amount of information required about samples was much increased at the present day; for instance, milk analysis which was formerly mainly concerned with the question of watering was now trequired to give a full account of the bacteriological condition he nature of any preservatives, &c. It was not easy to fulfil, all the exacting conditions in a private laboratory, and he suggested that the time was now ripe for the institution of official laboratories in charge of experts and staffed by full-time assistants. Central laboratories in sections of the country should deal with specialised substances, *e.g.*, all water and sewage samples might be sent to one, oils and fats to another.

The CHAIRMAN (Mr. J. H. Dunford) as an inspector of milk supplies, said he was struck with the necessity for more cleanliness. Under the Fertilisers Act it was an offence to sell a product having a higher percentage than that demanded by the Act.

Mr. J. WHITE considered that the variety and difficulty of the work gave interest to the profession. Milk, as produced by a normal healthy cow, was clean and sterile. We subjected it to all sorts of contaminations, and then tried to purify it again. This was beginning at the wrong end. Milk was the one article, the purity of which should be controlled by the Government in the interests of the consumer.

Major TROTMAN agreed with Mr. Burford. The analyst was so overwhelmed with routine work that he had no time for research in analytical methods.

Mr. H. DROOP RICHMOND, while being struck in general with the idea of sectional laboratories, considered that the expert in charge of routine work would soon get out of touch with the industry. The analyst as a consultant was generally in contact with problems, and he simply had to make time to deal with analytical problems, as indeed Major Trotman had done.

Mr. PENTECOST considered that the results of the Public Analyst should be made accessible to the public. They might be published, like the work of the Medical Officer.

Mr. WILKIE suggested that Mr. Burford might find it useful to refer to a recent Paper by Cofman on the French system of territorial laboratories. He alluded to the numerous original results by which Major Trotman had enriched the science. He agreed that the demands on the versatility and time of the Public Analyst were much greater than formerly, and his remuneration should be increased as recommended by the Institute of Chemistry.

Mr. BURFORD remarked on the curious uniformity of milk samples taken from different places, and considered it was due to the blending of small supplies.

Mr. RICHMOND suggested that large concerns probably kept their own analysts, and eliminated any undesirable samples.

Traders' Amalgamation

A JOINT meeting of the Chemical & Dyestuff Traders' Association and the British Chemical Trade Association was held at the Cannon Street Hotel, London, on Thursday afternoon, under the presidency of Mr. Tredwin, chairman of the Merchants' Committee of the London Chamber of Commerce, to consider the question of amalgamation. Resolutions were carried in favour of the general principle agreeing that the name of the combined Associations should be The British Chemical and Dyestuff Traders' Association, and fixing the annual subscription at £10 10s. Several questions of detail were referred to a joint committee composed of six delegates from each Association, with Mr. Tredwin as independent chairman.

The new company which has been formed in Belgium with a capital of 36 million francs to manufacture glass under the Fourcault patents proposes to commence building operations at Genck next month.

Electro Synthesis

The Need for Further Research

At the Royal Institution, on April 22, Sir James Walker, giving an Evening Discourse on Electro Synthesis in Organic Chemistry, said that the subject was a very technical one, and he was afraid that at a time when chemists and physicists were engaged in unravelling the nature and structure of the atom to speak of the method of the synthesis of a very limited class of organic compounds might not be found to be very interesting. His apology, however, was, in the first instance, that he had had some practical experience of the subject, and in the second place the subject, in its origin, was derived directly from the work of Davy and Faraday; and, finally, he might perhaps add as a kind of apology that the subject had been so consistently neglected that it had almost re-acquired the merit of novelty.

Electro-synthesis dated back to 1880, when water was decomposed by electrical current to obtain oxygen and hydrogen. Thus the subject was partly physical, partly electrical and partly chemical. Davy, however, found that pure water conducted electricity very badly, and that if certain substances were added to the water, or if the water merely dissolved these substances from the vessels in which it was contained, then electrolysis was effected. These substances were of the nature of salts or acids, and Davy's researches in this direction culminated in his discovery of the alkali metals, sodium and potassium. He found that by passing an electric current through caustic potash and caustic soda he was able to decompose these substances, and arrive at potassium and sodium. Later Faraday took up the question of quantitative relationship between substances which appeared during electrolysis and the quantity of current which was passed through the solution which had been submitted to electrolysis. His researches resulted in the definite establishment of the relationship between the quantity of electricity and the quantity of matter, and Faraday laid down certain laws which were now well established.

Organic chemistry nowadays meant the chemistry of the carbon compound, which was a class of compound that Faraday did not study. The study of this class of compound was begun by Kolbe in 1849, and it was to Kolbe's work and those succeeding him in regard to electro-synthesis that he intended to call attention. The lecturer, as a first experiment, took a small nickel crucible, surrounded by water to keep it cool, inside which was a spiral of platinum wire, the nickel crucible forming the negative electrode and the platinum wire the positive. By dissolving potassium malonate in water and placing this inside the crucible, and passing an electric current through it, he was able to produce diethyl-succinate. The particular character of the electrolyte in the crucible, however, was immaterial, and it was the nature of the synthesis which he was anxious to make clear. The effect of passing an electric current through this electrolyte was that it was possible to join together a chain of carbon compounds, building them up gradually and repeating the process, so that the length of the chain, which first consisted of two atoms, could be doubled and doubled again; thus there was the possibility of getting a very long chain of carbon compounds by electro-synthesis.

Kolbe did not start his study of electro-synthesis by electrolysing such a substance as the one which he (Sir James Walker) had taken, but began his researches on more complex substances. A simple case, however, was that of potassium-acetate, the products of the electrolysis of which were gases, and it was easier, in a way, to find out relationships and to show experiments with gases than it was with liquids, because larger volumes could be used, and the properties could be seen much more readily.

Placing in a glass vessel a piece of platinum foil and platinum wire, and using the latter as the positive electrode and the former as the negative electrode, Sir James Walker exhibited the products of this electrolysis by condensing a part of them in liquid air, obtaining a mixture of carbonic acid gas and ethane. That, he said, was the simplest case of electro-synthesis, ethane being formed with the carbon dioxide and being condensed to the solid state. The existence of the ethane was demonstrated by the luminous flame which it gave off, and this process was one of the simplest methods of preparing ethane. It was important, continued Sir James, to consider the physical as well as the chemical side of this process, and he explained how, in the process of the production of ethane, the carbon chains were formed.

Kolbe effected the synthesis of a number of hydrocarbons, but the next step was taken by his (Sir James Walker's) teacher and predecessor in the Chair at Edinburgh, namely, Professor Crum Brown, in 1890. Professor Crum Brown had mentioned to him one day that he always wanted to synthesise mucic acid, and he had attempted to do it by electrolysing an ester salt, but without result. The lecturer thought he would like to try his hand at it. At that time he had just returned from Germany, where he had been working under Ostwald, and had obtained a very good acquaintance with Professor Arrhenius, of Stockholm, whose theory of electrolytic dissociation had been brought forward a few years before. His knowledge of that theory of electrolytic dissociation gave him some notion of the physical conditions to be fulfilled if such a synthesis was to be satisfactory. The substance he first tried himself was sodium-ethyl-melonate. When such a substance was electrolysed two molecules came together, as before, and the result was the production of diethyl-succinate. This substance had an ethyl group at each end, and it was not difficult chemically to exchange one of the ethyl groups for a sodium atom; and that ethyl group could be converted into an ester salt again. He had got as far as $16CH_2$ groups in this way, and the process would go no further; he had attempted to prepare a chain of 32 CH_2 groups, but so far without success.

Incidentally, Sir James Walker mentioned that he had been shown two of Faraday's original pieces of electrolytic apparatus, which in form were exactly the same as the apparatus that he himself was using that evening, and it was evident that we had made no progress with regard to apparatus. A study of the subject showed that it was necessary, in getting these chemical results, to pay attention to the physical conditions. It was not merely a matter of passing a current through a solution of sodium acetate, because, using certain conditions, they would get the synthesis, but, using other conditions, they would miss the synthesis altogether. If Kolbe had used gold electrodes instead of platinum electrodes he would not have got his famous synthesis of ethane. It was not only necessary to pay attention to the metal, but also to the current, whilst it was also highly essential that the positive electrode should be small, in order that the discharged negative ions should be closely packed together. The subject had suffered a good deal of neglect, but recently he had turned some of his students on to it, and hoped to extend the method in some directions.

One point to which attention should be particularly drawn was that methods for the building up of complex organic compounds were very often carried out at high temperatures and in curious solvents, such as alcohol, ether, benzene, and so on; one peculiarity of this method was that the conditions resembled those in which complex organic substances were built up in the animal and plant body, but were it not for the fact that water cooling was adopted, he would not have succeeded in preparing diethyl succinate. It was necessary to keep the temperature down to 30°C., and he had found that the method of electro-synthesis worked best at temperatures between 20 and 30°C., and in aqueous solutions.

New French Oil Bill

REUTER'S Paris correspondent states that a Bill has been deposited in the French Chamber authorising the liquidation of the State petroleum stocks at current prices, imports to be free from May 1, on condition, first, that importers upon the arrival of oils at the Customs must accept delivery from the Government's stocks of a quantity of petroleum equal to that being imported; secondly, that a tax on imported oil must be paid to the Government in order to compensate for the drop in price of the Government stocks caused by imports; thirdly, importers must at all times have at the disposal of the State a reserve stock equivalent to a quarter of the quantity imported during the previous 12 months; fourthly, that they allow the consumer to benefit by the decrease in prices accepted by the State taking into account the tax.

Investigations are to be made in the districts of Marmaros and Zemplin, in the Czecho-Slovak republic with a view to INSTALLING NEW SALT WORKS.

The Spectroscope

Uses of the Sector Spectraphotometer

IN the course of his final lecture on The Spectroscope in Science and Industry at the Royal Society of Arts on April 25, Dr. S. J. Lewis said that the modern development of the sector spectraphotometer was due to the assistance given by the Beit Research Fund Committee of the Pathological Association, which decided to have a research on blood serum carried out at the time when he (Dr. Lewis) had given the first British order for a Hilger sector spectraphotometer.

An important industrial use of the instrument was in the examination of cellulose and cellulose derivatives, whilst the relation of rubber to the absorption of light and especially ultra violet light, had for a long time been a subject of investigation, especially in regard to the variation of rubber under the influence of sunlight. The Rubber Research Association had taken the matter in hand, but until a few months ago no systematic examination of a quantitative character of rubber appeared to have been made. Previous efforts had been in the direction of the incorporation of dyes in the rubber to absorb the ultra violet rays at the surface, and so prevent their penetration into the body of the material. Since then a great deal of knowledge had been gained as to how ultra violet light penetrated rubber and caused deterioration, and at the same time, an important step had been taken towards the study of the chemistry of rubber. Similarly, glass had been investigated, and three new types had been evolved as the result of spectroscopic examination.

Chemical Equilibrium

A good example of the investigation of the quantitative absorption of light by simple inorganic substances was the work of Brennion and Macbeth, of Belfast, among whose work special attention might be called to an investigation of the chlorides, bromides and iodides and their alkali metals. This work demonstrated that these salts exhibited well-defined absorption bands in the ultra violet region, and that the frequency of the bands decreased with the increase of the atomic weight. This investigation had made it possible for light to be thrown on the study of the chemical equilibrium in a solution.

These indications of the possibilities of the new sector spectraphotometers opened up altogether new fields of investigation, and it should be possible to take absorption spectra as rapidly as twenty or thirty per minute, and thus follow the course of chemical reactions in great detail. Considerable work had been done in relation to gases, and the determination of small quantities of nitrogen peroxide in gases evolved during the decomposition of guncotton by Robertson and Knapper, and the results obtained agreed closely with those previously obtained chemically.

Fluorescence

Discussing the question of fluorescence and phosphorescence, Dr. Lewis referred to a series of investigations upon cellulose and its derivatives, which had been carried out at the suggestion of Mr. Cross, following some comment by Hartley, in 1897, who called attention to the fact that unsized paper was remarkably fluorescent. This work had been carried out under the auspices of the Council of the Society of Dyers and Colourists, aided financially by the Department of Scientific and Industrial Research. A series of four classes of paper was examined, which were named normal, abnormal, acetate and nitrate. It was found that the normal paper gave a medium strong fluorescent effect, the second type gave a stronger effect, and the third a still stronger, but the cellulose nitrates gave no effect at all, thus bearing out the knowledge obtained from general chemistry that acetic acid increases fluorescent effect and nitric acid decreases it. It had been found that the character of the absorption curve was in some measure an expression of the chemical constitution of cellulose, but there was still a considerable field for further work in this direction.

In concluding his lecture, Dr. Lewis said we were not far from the day when the spectroscope would be found an essential adjunct in all departments of science and industry.

Sulphates Proprietary, Ltd., have perfected a process for the production of SULPHATE OF ALUMINA from the recently discovered bauxite deposits in Gippsland, Victoria.

Price of Soda Crystals

Magistrate Reserves Decision

ON April 22 an adjourned summons was heard at the Guildhall against John Charles Mascarenhas, trading as J. Lloyd & Co., of Broad Street House, E.C., charging him with having on June 4 last sold to Salmou & Co., of Holloway, 10 tons of soda crystals at such a price as to yield, in view of all the circumstances, a profit which was unreasonable.

Mr. H. D. Roome appeared for the Director of Public Prosecutions, who was prosecuting on behalf of the Board of Trade. The crystals in question were purchased from Heath & Co., of Liverpool.

The case for the prosecution was closed last week.

Mr. Warren, counsel for the defence, now said he wished to make a submission in law. His first point was that there was no proof, no evidence had been given, to show that soda crystals came within the 1919 Act, under which these proceedings were taken—and in such a highly penal statute as this, where the penalties were very severe, it was necessary to be quite sure they were dealing with an article included. He contended that there was no case to answer. His second point was that there was no proper party to these proceedings. It was laid down in the Act that the Board of Trade was, where there had been infringement, to be the authority to take action, one section stating that the Board of Trade might have costs awarded to or against it. No evidence of authority to prosecute had been given to the investigating officer of the department, and there was no provision for the Board to delegate its power to the Director of Public Prosecutions. Who the Board of Trade was was a matter of some conjecture. His last point, said Mr. Warren, was that they were out of time. When no provision for time was made in an Act they had recourse to the Summary Jurisdiction Act of 1847, and the limit there was six months.

Mr. H. D. Roome remarked that by reference to the Amending Act it would be seen that proceedings might be instituted any time within twelve months; inquiries in these cases always took a considerable time.

Mr. Stubbs at this point was recalled to give evidence as to having authority to lay an information in this case, and Mr. Roome read from the schedule in the Act a list of things given as examples of the class of goods included under the Profiteering Act as household requisites. Those included were all household utensils, "polishing pastes," "soap and soap substitutes," &c.

Mr. Warren: Soda crystals are not a soap substitute!

Mr. Alderman Newman held that they came within the meaning of the Act, and that he must over-rule the objections taken by Mr. Warren.

The defendant, giving evidence, said he had been in the chemical and drug trade for 25 years, and he carried on the business of an analyst and export druggist. The total amount he received from Messrs. Salmon was £136 14s. 2d.; against that he had paid £112 8s. 2d. for the crystals, and that left a net gain of £24 6s. The defendant produced an invoice and receipts which were examined. His intended profit, he said, was 17½ per cent. He first bought the crystals at £12 10s. per ton, and sold at £16 15s.

Mr. W. Russell Luscombe, of the Produce Brokers' Association, St. Mary Axe, having given further evidence for the defence, Mr. Alderman Newman announced that he would reserve his decision until May 11, when counsel on both sides would be engaged in a case said to be of a similar nature.

Kelvin Medal Award

THE presentation of the first award of the Kelvin Medal will be made by Mr. Balfour in the Hall of the Institution of Civil Engineers to Dr. William Cawthorne Unwin, F.R.S., on May 4, at 4 p.m. The medal was founded in 1914, principally by British and American engineers. The award is made in recognition of pre-eminence in the branches of engineering with which Lord Kelvin's scientific work and researches were identified by a committee of the presidents of the representative British engineering institutions, after considering recommendations received from similar bodies in all parts of the world.

Benn Brothers Staff Dinner

THE staff of Benn Brothers, Ltd. (publishers of THE CHEMICAL AGE and numerous other trade and technical journals), was entertained by the directors at dinner at the Holborn Restaurant London, on Friday, April 22. Sir John Benn, Bart., Chairman of the Company, occupied the chair, and the company included Lady Benn and about two hundred members of the staff.

After the loyal toast had been honoured, Mr. H. P. Shapland, in proposing "The Staff," said that it included two hundred and fifty people in the direct employ of Benn Brothers, Ltd., and if it might be held to cover contributors all over the kingdom, newsagents all over the world, and those engaged in printing and engraving, about two thousand people were engaged week by week in producing and distributing the firm's journals.

Mr. J. W. CUSDEN, in responding, spoke of the cordial relationship existing between the directors and the staff.

Captain F. H. MASTERS, O.B.E., proposed "The Directors," and suggested that a sui able motto for the firm would be "Tradition and Progress."

Mr. ERNEST BENN (managing director), in reply, referred to his intended visit to America. He was going to the United States, he said, because in his view the trade and technical press was destined to play a very much larger part in the affairs of the world in the future than it had done in the past, and also because he was convinced that the future happiness of the nations largely depended upon cordial relations between the United States and the United Kingdom. If anything was known in America about the production of trade papers which had not been heard of at 6 and 8, Bouverie Street, he hoped to find out all about it. In his view the success of Benn Brothers, Ltd., was due to one or two simple causes. First of all to hard work, and secondly, because commercial men all over the Kingdom recognised that their enterprise in Bouverie Street was rendering help to the business world. Every member of the staff was conscious of being of use to the community; as a firm they were rendering real service in promoting business for British firms in markets at home and abroad. Mr. Benn also announced the result of the ballot for the committee of Benn Brothers Social Circle, the institution of which he welcomed as one of the most important happenings of the year because of its value in increasing the spirit of goodwill and the cordial relationship which already existed among their members.

An interesting musical programme followed.

Chemical Manufacturers' Losses

Company to be Wound Up

AT Newcastle County Court, on April 20, before Judge Greenwell, application for the compulsory winding up of the Tyne Chemical Produce Co., Ltd., was made by Mr. Edward Redhead, of Elswick Road.

Mr. H. S. MUNDAHL, who appeared for the petitioner, explained that the company was formed in December, 1919, for the purpose of the manufacture of soap, &c. The capital consisted of £2,200, subscribed by four directors, two of whom contributed £1,000 each, and the other two £100 each. Before twelve months expired one of the directors had to go to South Africa. It was found on the first year's trading that there had been a loss of £1,000, and it was deemed advisable to wind up the company, but as one of the directors would not take any steps in that direction the present proceedings were commenced. Mr. Redhead was one of the directors, and he had a claim for £1,500, for which he had obtained judgment. He had not taken any steps to levy execution, however, as he did not want to obtain any preference, but he considered the best thing to do was to have the trading loss stopped.

Mr. T. FORSTER, who appeared for Mr. Showock, another director, offered no objection to an order being made for the company to be wound up, and the Judge made an order subject to a further affidavit being filed, giving particulars of the balance sheet.

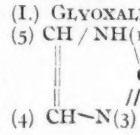
Speaking at the inauguration of the Institute of Physics on Wednesday, Mr. Balfour expressed surprise that the imagination of some of our magnates had not been inspired by the unselfish idea that it lay in their power to increase the wealth of the whole world by promoting and financing SCIENTIFIC RESEARCH WORK in relation to industry.

Manchester College of Technology

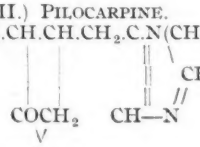
ON Tuesday, April 12, Professor F. L. Pyman delivered his presidential Address to the Manchester College of Technology Evening Students' Chemical Society on "Substitution in the Glyoxaline Ring."

The Glyoxaline ring, he explained, which has the formula (I.) occurred in such substances as pilocarpine (II.), and caffeine (III.). It was also found in the hydrolysis products of hæmoglobin amongst which was histidine (IV.). On heating with potassium hydrogen sulphate the carboxyl group was eliminated yielding the highly poisonous ptomaine amino ethyl glyoxaline (V.)

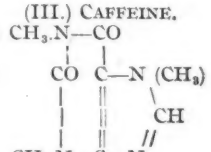
(I.) GLYOXALINE.



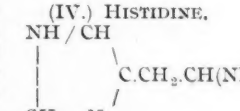
(II.) PILOCARPINE.



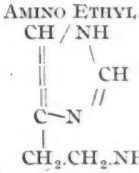
(III.) CAFFEINE.



(IV.) HISTIDINE.



(V.) AMINO ETHYL GLYOXALINE.



Owing to the fact that glyoxaline was a tautomeric body the positions (4) and (5) were equivalent. This had been proved from the two syntheses (*a*) from *a*-amino diethyl ketone and (*b*) from *a*-amino propyl methyl ketone. The first synthesis yielded 5-ethyl-4-methyl glyoxaline, and the second yielded 4-ethyl-5-methyl glyoxaline, and these two bodies were identical. Methylation of 4-methyl-glyoxaline yielded a mixture of 1 : 4 and 1 : 5 dimethyl glyoxaline, thus adding evidence to the tautomeric structure of glyoxaline. Nitration with mixed acid only yielded a nitro derivative when the 4 and 5 position was free. Reduction of the nitro compounds yielded the unstable amino glyoxalines which readily decomposed into glycine, ammonia and formic acid.

Glyoxaline was extremely resistant to sulphonation, it being necessary to use 60 per cent. oleum at a temperature of 160°C. to obtain the sulphonic acid. Substitution in the (2) position was effected by treatment with bromine which yielded a mixture of tribromo glyoxaline and glyoxaline hydrobromide. An alkaline solution of the base coupled with diazo benzene, yielding 2-benzene azo glyoxaline. In the same way 4-methyl glyoxaline yielded a mixture of 4-methyl-2-benzene azo glyoxaline 5-methyl-2-benzene azo glyoxaline and 2·5-benzene bisazo glyoxaline.

In reply to questions Professor Pyman stated that the base itself was extremely stable, but broke down under the action of an alkaline oxidising agent.

The Sale of Fertilisers

Corporation Appeal Dismissed

ON April 22, a King's Bench Divisional Court, consisting of the Lord Chief Justice and Justices Avory and Darling, heard an appeal from a decision of the Hull Justices, dismissing a prosecution by the Hull Corporation against John Prindell, of Hornsea, for non-compliance with the Fertiliser and Feeding Stuffs Act, 1906, in failing to send an invoice to the Humber Fish & Manure Co., to whom he sold 6 tons of phosphate of lime.

Appearing for the appellants, Mr. Latter said the Fertilisers and Feeding Stuffs Act laid down that the seller of fertilisers should deliver an invoice on which were stated the percentages of the different elements contained therein. There were, he said, two offences:—(1) not sending an invoice, and (2) sending a false invoice. In the present case the prosecution was for sending no invoice at all. After hearing the evidence for the prosecution, the justices dismissed the case on the ground that the provision for taking an analysis, and sending a copy to the defendant, had not been complied with. The Court dismissed the appeal.

The Lord Chief Justice, giving judgment, said that the provisions of the Act not having been complied with, the justices were right in refusing to convict.

From Week to Week

There were three FATAL ACCIDENTS in chemical works during March.

Mr. A. G. Lobley has been appointed a reader in electro-chemistry in the University of Oxford.

THE NET PROFIT for the past year of the Baden Aniline Soda Factory is stated to be 65 million marks.

According to tables compiled by the Banking Section of the Department of Overseas Trade, CAPITAL INCREASES IN THE CHEMICAL INDUSTRY during March totalled £134,600.

A new NON-FREEZING EXPLOSIVE is being manufactured by the Atlas Powder Co., of Philadelphia. The explosive is reported to be extremely stable, requiring a powerful blasting cap for successful detonation.

Professor Einstein has accepted an invitation from King's College, London, to give a lecture or lectures at the college on his return from America early in May. The date and subject of his lecture will be announced later.

At the Spring Conference of the English Textile Institute to be held at Basle during Whit-week, Mr. W. Stanpacher, a Swiss representative, will read a paper on the "Dye Industry and its Future," and Mr. E. Tissol, another Swiss representative, one on the industrial application of electricity.

As an indication of the growth of the RUBBER INDUSTRY IN CANADA, Mr. Carlisle, President of the Rubber Association of Canada, states that the rubber business has expanded in a period of nine years from $4,600,000 to over $56,000,000. The number of employees has increased from less than 1,500 to 13,000.

It is reported that the Swiss Metal and Cable Works at Dornach have recently taken up a new process for the manufacture of a special aluminium, which it is stated, possesses properties which permit of its use in the manufacture of screws, bolts, and for other purposes for which ordinary aluminium could hitherto not be employed.

Dr. H. W. Brownsdon has been re-elected chairman of the Birmingham & Midland Section of the SOCIETY OF CHEMICAL INDUSTRY, and Mr. F. R. O'Shaughnessy, hon. local secretary and treasurer. The new vice-chairmen are Professor G. T. Morgan (Chemical Department, University of Birmingham) and Dr. E. B. Maxted; and the following constitute the committee: Messrs. W. Brazier, G. H. Blenkarn, F. L. W. Bradford, H. T. Pinnock and W. C. Davis.

On Thursday next, May 5, at three o'clock, Dr. C. S. Myers will deliver the first of two lectures at the Royal Institution on Psychological Studies—(1) "The Localisation of Sound" and (2) "The Appreciation of Music." On Saturday, May 7, Professor E. C. C. Baly will begin a course of two lectures on "Chemical Reaction." The Friday evening lecture on May 6 will be delivered by Sir Robert Robertson, on "War Developments of Explosives"; and on May 13 by Dr. W. Bateson, on "The Determination of Sex."

The death occurred on April 21, at Auchendennan, Lochlomondside, of Mr. WILLIAM JAMES CHRYSTAL, senior partner in the firm of John & James White, chemical manufacturers, Shawfield Works, Rutherglen. Mr. Chrystal was the inventor of a number of improvements in connexion with chemical processes and was on the board of several industrial enterprises, including the Burmah Oil Co. He was also a governor of the Glasgow & West of Scotland Technical College. He is survived by his wife and daughter, and one son, Major R. Chrystal.

The Faraday Society is organising a general discussion on PHYSICO-CHEMICAL PROBLEMS RELATING TO THE SOIL, to take place during the afternoon and evening of May 31. The meeting will be held in the rooms of the Chemical Society, London, and it will be presided over by Sir A. Daniel Hall, K.C.B., F.R.S., Chief Scientific Advisor to the Board of Agriculture. The discussion will be opened by Dr. E. J. Russell, F.R.S., Director of the Rothamsted Experimental Station, who will give a general survey of the subject. A series of papers dealing with Soil Moisture, Organic Constituents, Adsorption and Colloidal Phenomena will then be put forward as a basis for discussion. It is expected that among those present will be Professor Sven Oden, of the University of Upsala. Further particulars of the meeting may be obtained from the Secretary of the Faraday Society, 10, Essex Street, London, W.C.2.

Chemical Matters in Parliament

Key Industries Bill

Replying to Mr. Pennefather (House of Commons, April 25), Mr. Lloyd George said that but for circumstances connected with the great industrial dispute the Financial Resolutions to the Safeguarding of Industries Bill would have been taken directly after Easter. He could not now fix a date for them, but they would be taken as early as possible.

Excess Profits Duty

Mr. Clough (House of Commons, April 21), asked the Chancellor of the Exchequer whether, in any abandonment of the Excess Profits Duty, he would consider and make allowances for the position of firms who had included in their balance sheets long dated bills and acceptances which had, for the purposes of the Duty, been treated as sound assets, yet might not be met at maturity; and whether he would provide for at least partial recovery of losses thereby sustained?

Lieut.-Commander Young said the suggestion was under consideration.

Basic Slag

Replying to Sir J. Norton-Griffiths (House of Commons, April 20), the Minister of Agriculture said the Government did not own, and, so far as he was aware, had not at any time owned, any quantities of basic slag other than the small quantities required from time to time for use in the Ministry's own farm settlements or experiments. No licence was necessary for the importation of ground basic slag. The quantity of basic slag imported during the six months ending March 31, 1921, was 15,769 tons of a declared value of £125,832. Ground and unground slag were not separately distinguished in the Customs Returns, and it was probable that the bulk of the slag imported was in an unground state.

German Reparations

Mr. Bottomley (House of Commons, April 25) asked the Prime Minister whether he could state approximately what had been received by the British Treasury in respect of the levy upon goods imported from Germany under the terms of the recent Act?

Lieut.-Commander Young said the amount paid into the special account opened under the German Reparation (Recovery) Act, 1921, up to and including the 21st instant was £3,000.

Lieut-Commander Kenworthy asked the President of the Board of Trade whether samples of goods coming to this country from Germany in the ordinary course of trade would have to pay the 50 per cent. duty; if he was aware of the great delay merchants experienced in obtaining their samples from the Customs; and whether anything could be done to simplify the process.

Lieut.-Commander Young, replying, said no payment under the German Reparation (Recovery) Act, 1921, was required on the importation of *bona fide* trade samples. Some congestion had occurred in the examination of parcel mails from Germany, which might contain samples, but under special arrangements made by the General Post Office and the Commissioners of Customs and Excise this initial difficulty was being rapidly overcome. Otherwise, he was not aware of any delay in the delivery of samples.

Captain Wedgwood Benn (House of Commons, April 26), asked the Financial Secretary to the Treasury whether the amount payable by a British importer, under the German Reparation (Recovery) Act, was 50 per cent. of the invoice value of the goods or an amount equal to any amount paid to the German trader regardless of the value of the goods?

Lieut.-Commander Young said the German Reparations (Recovery) Act, 1921, diverted to the Commissioners of Customs and Excise one-half of the value of imported German goods, as defined in the Act. Such value was expressly defined as including the sum payable to the Commissioners.

At a recent meeting of the Société de Chimie Industrielle, it was announced that the proposal to publish a JOINT ABSTRACT JOURNAL for pure and applied chemistry had been abandoned. It was agreed that the State subsidy granted for this purpose should be shared by the *Bulletin de la Société Chimique* and *Chimie et Industrie*, which will publish abstracts in pure and applied chemistry, respectively.

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DYES. The economic energy of the American dyestuff industry. L. W. Alwyn-Schmidt. *Color Td. J.*, April, 1921, pp. 115-117.

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On the strengthening of adsorption. G. Wiegner, J. Magasanik, and A. J. Virtanen. *Kolloid Z.*, February, 1921, pp. 51-76.

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Colloid chemistry and photography. Lüppo-Cramer. *Kolloid Z.*, February, 1921, pp. 90-93.

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ACENAPHTHENE. On pericyclic derivatives of acenaphthene. K. Fleischer and F. Siefert. *Annalen*, February 24, 1921, pp. 317-325.

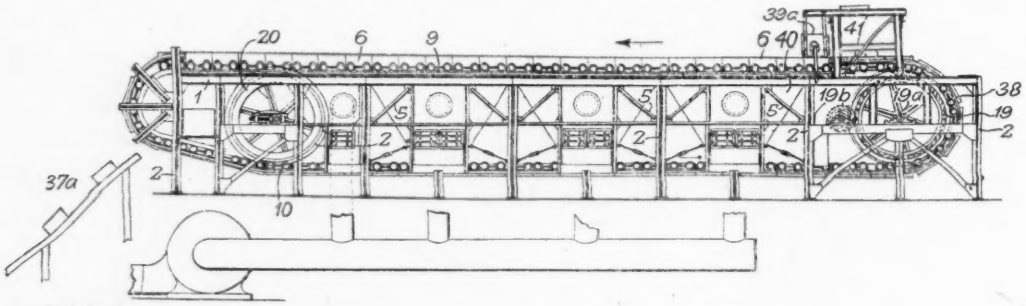
BENZILIC ACID. On benzilic acid. J. Herzig and M. Schleiffer. *Annalen*, February 24, 1921, pp. 326-332.

Patent Literature

Abstracts of Complete Specifications

160,477. ROASTING AND SINTERING OF ORES AND THE LIKE. R. L. Lloyd, 29, Broadway, New York. Application date September 4, 1919.

The apparatus is for roasting and sintering ores by Dwight and Lloyd processes. The framework of the apparatus consists of longitudinal sill beams 1, uprights 2 and braces 5. The ore carriers 6 are small separate pallets or cars with perforated bottoms. Each has side walls 11, grate bars 7[b],



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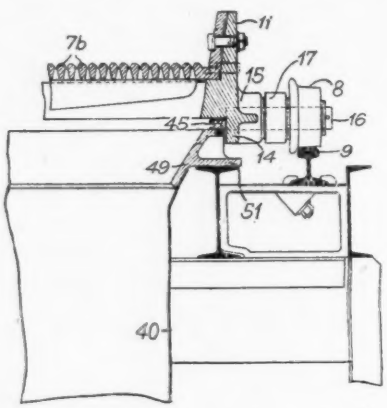
downwardly extending flanges 14, and perforated bosses 15, carrying spindles 16. The spindles carry track wheels 8 and anti-friction sprocket rollers 17. The wheels 8 travel on the upper track rails 9 and the lower rails 10. Sprocket wheels 19 on shafts 19[a] are driven by toothed gearing from shaft 19[b] which is driven by a motor through speed-reducing gear. The sprocket rollers 17 are engaged by the teeth on the sprocket wheels 19 to lift the pallets from the lower run to the upper



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run 9 and the wheels 8 engage with curved guide rails 38. The pallets have no front or rear walls, and their side walls thus form a continuous trough in which the ore is contained. Sprocket wheels 20 are mounted near the discharge end of the frame and engage with the rollers 17 on the upper and lower run of pallets so that as the wheels 20 are driven by the upper pallets, the lower pallets are advanced by them in the return direction. Ore is supplied to the pallets from a hopper 41 and discharged at 37[a]. The igniting apparatus 39[a] is a hood arranged just over the pallets, which is supplied with a jet of powdered carbon which is ignited and directed downwards on to the ore. This is found more satisfactory than a jet of oil, vapour or gas. Air is forced downwards through the ore into one or more chambers 40 having inclined walls 49 supported by flanges 51. The pallets do not rest on the air chamber walls but on rails 9, and the flanges 14 make contact with packing strips 45 to make an air-tight joint.

160,482. WOOD OR OTHER SUBSTANCES CONTAINING CELLULOSE, PROCESS FOR THE TREATMENT OF—FOR THE PURPOSE OF OBTAINING CELLULOSE AND ARTIFICIAL RESIN, ASPHALT LAC AND THE LIKE. C. Claessen, 36, Dorotheenstrasse, Berlin, N.W.7. Application date, October 17, 1919.

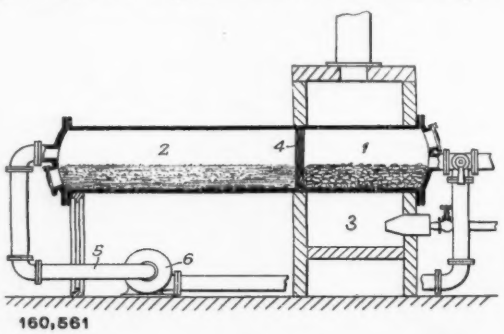
Material, such as wood waste, paper waste, or other substance containing cellulose is heated with monovalent or polyvalent phenols or their homologues and substitution products together with 0·01 per cent. of hydrochloric acid to about 100°C. for a few hours. The excess of liquid is then removed from the pulp, which is freed from residual phenol by solution. The liquid contains a lac or resin which is recovered either by distillation or precipitation. The pulp consists of a white bleached cellulose.

160,499. VULCANISED RUBBER GOODS AND MATERIALS CONTAINING SUBSTANCES WHICH ARE ADVERSELY AFFECTED BY CERTAIN VULCANISING PROCESSES, PROCESS FOR OBTAINING. S. J. Peachey, 5, Yew Tree Road, Davenport, near Stockport, and A. Skipsey, Red Lea, Scarborough. Application date, November 24, 1919.

In vulcanising mixtures of indiarubber with filling materials such as sawdust, wood meal, leather waste, cork dust, wool waste and the like, these materials are adversely affected by sulphur at the vulcanising temperature, or by sulphur chloride. Further, lake pigments derived from coal tar dyestuffs are also affected. It is now found that these materials are not affected if the rubber is subjected to the cold vulcanising process described in specification 129,826, by alternate treatment with sulphur dioxide and hydrogen sulphide.

160,561. PURE CARBON, PRODUCTION OF. F. C. Dyche-Teague, 258, Gloucester Terrace, London, W. 2. Application date, December 23, 1919.

The object is to obtain pure carbon in a finely divided condition by the passage of carbon monoxide over a catalyst of finely divided iron at 300°C. Carbon monoxide is generated



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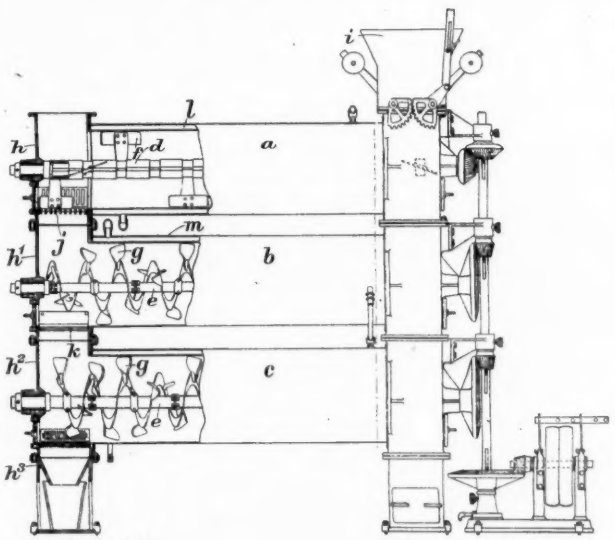
from coke in a retort 1 heated by a gas furnace 3 or alternatively by internal electric heating. Finely divided iron is spread on trays in a retort 2 separated from the retort 1 by a porous firebrick screen 4, which permits the passage of gas but

prevents the passage of dust. The carbon monoxide is converted into carbon dioxide and carbon, and the latter is returned through a pipe 5 and fan 6 to the retort 1 for re-conversion into carbon monoxide. The mixture in the retort 2 is then blown through a magnetic field where the iron is separated, and the carbon passes on.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention :—137,064 (Darrasse Freres et Cie) relating to valeric acid and alkaline valerates, *see* Vol. II, p. 260 ; 139,195 (V. Gerber), relating to aluminium nitride, *see* Vol. II, p. 479 ; 145,071 (A. Wohl), relating to phthalic anhydride, *see* Vol. III, p. 240 ; 145,408 (G. A. Pestalozzi) relating to tar of aliphatic compounds or low temperature tar *see* Vol. III, p. 268 ; 145,614 and 155,575-6 (E. Kolshorn) relating to derivatives of *p*-aminophenol and its *o*-alkyl ethers, *see* Vol. III, p. 293 and Vol. IV, p. 286.

160,556. LIME, APPARATUS FOR THE HYDRATION OF—AND FOR SIMILAR PURPOSES. E. R. Sutcliffe, 93, Church Street, Leigh, Lancashire. Application date, December 22, 1919.

The apparatus is for the hydration of lime or mixtures of lime and sand, clinker and lime, oxides of metals and other substances, the product being obtained in a dry condition. Three cylinders, *a*, *b*, and *c*, are arranged one above the other and are provided with coaxial shafts *d*, *e*, carrying blades *f*, *g*, which are arranged at such an angle that the material is mixed and fed forward. Each cylinder is provided with short transverse cylinders *h*, h^1, h^2 at each end so that when assembled, these cylinders form vertical conduits. The material is fed



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into the uppermost cylinder by a hopper *i* and is sprayed with water by perforated longitudinal pipes in the upper part of the cylinder. Any steam arising from the other cylinders is condensed by a water jacket *l*. The hydrated material then passes through a grating *j* into the next cylinder through which it is fed to the inlet of the third cylinder. Steam jackets *m* surround the upper part of these cylinders and are connected in series so that the material finally delivered to the outlet h^3 is dried. A plate *k* is provided to prevent direct passage of the material from the first to the third cylinder.

International Specifications not yet Accepted

158,558. SYNTHETIC DRUGS. Chemische Fabrik Auf Aktien vorm. E. Schering, 170, Mullerstrasse, Berlin. International Convention date, January 26, 1920.

Dimethylamino-dimethylphenylpyrazolone and diethylbarbituric acid are melted together in molecular proportions to obtain a double compound.

158,836. EFFECTING CHEMICAL REACTIONS. T. Goldschmidt Akt-Ges., 18, Salkenbergsweg, Essen, Germany, and H. Arnold, 8, Eduardstrasse, Essen, Germany. International Convention date, February 7, 1920.

In certain chemical reactions a state of equilibrium is reached before the completion of the reaction, and the object is to overcome this and render the reaction substantially complete. The materials are passed through a series of chambers at suitable temperatures and part of the reaction product is removed between them so that the reaction may re-commence in the next vessel. In an example, a mixture of chlorine and an industrial gas containing olefines is passed in succession through a heated chamber in which olefine chlorides are produced, and a chamber cooled to 20°C. in which the chlorides are separated.

158,849. AMMONIA, SYNTHETIC. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude, 48, Rue St. Lazard, Paris. International Convention date, February 2, 1920.

Ammonia is produced synthetically under very high pressure by the Claude process, and the residual gas is returned to the last cylinder of the high pressure compressor so that it passes again through the catalysing apparatus. The residual gas is discharged to atmosphere periodically to prevent accumulation of argon.

158,852. TAR DISTILLING. Barratt Co., 17, Battery Place, New York (Assignees of J. M. Weiss, New York.). International Convention date, February 7, 1920.

The object is to obtain a higher yield of oil, a smaller amount of free carbon, and pitches of higher melting point from coal tar, water-gas tar, blast furnace tar, lignite or other tar. A current of gas such as nitrogen, carbon dioxide, carbon monoxide, or a mixture of these, which is inert with respect to the tar and not soluble in it, is passed through the tar in a still. The gas then passes through a condenser coil where the distillate is removed to a pump, which returns it through a heater to the still. Air from which oxygen has been removed by passage through tar may also be used.

158,863. SODIUM BICARBONATE AND HYDROGEN. Nitrogen Corporation, 55, Canal Street, Providence, R.I., U.S.A. (Assignees of A. Nazelvoort, 55, Canal Street, Providence, R.I., U.S.A.) International Convention date, February 7, 1920.

Water gas is passed through Solvay carbonating towers to remove any sulphuretted hydrogen present, and is then mixed with steam and passed through a contact chamber containing a catalyst at a high temperature whereby the carbon monoxide is converted into dioxide. The resulting mixture of carbon and hydrogen is passed through another series of carbonating towers to precipitate sodium bicarbonate, leaving substantially pure hydrogen. Sodium bicarbonate may be calcined to obtain carbon dioxide for enriching the water gas. The hydrogen obtained may be used in the synthesis of ammonia.

LATEST NOTIFICATIONS.

161,924. Manufacture of methane. Fabwerke vorm. Meister, Lucius and Brüning. April 15, 1920.
161,926. Closing devices for receptacles for compressed or liquefied gases. Soc. Anon. D'Applications Des Gaz Liquefies. April 13, 1920.
161,928. Apparatus for delivering liquid or granular material in predetermined measured quantities. Martin, F. P. April 12, 1920.
161,929. Liquid fuel and method of manufacturing it. Bates, L. W. April 12, 1920.
161,934. Rotary Blowers. Westinghouse Electric & Manufacturing Co. April 16, 1920.
161,949. Method for the use of basalt. Soc. Le Basalte. April 17, 1920.
161,942. Process and apparatus for removing oil from condensation waters. Gail, J. B., and Adams, N. April 15, 1920.
161,581. Process for the manufacture of sulphurous acid. Rhenania Verein Chemischer Fabriken Akt. Ges. April 14, 1920.
161,585. Petrol and like liquid containers. Burin (*nee* Glineur), C. B. April 16, 1920.

Specifications Accepted, with Date of Application

109,969. Acetone and the higher alcohols, particularly butyl-alcohol, Method and apparatus for the production by fermentation of. A. Fernbach. August 31, 1916.

136,543. Silica gels and processes of making same. W. A. Patrick, December 7, 1918.
137,065. Soot carbon, retort graphite and other carbon products from natural gas, Process for the production of. Rutgerswerke Akt.-Ges. June 12, 1918.
139,168. Liquors containing phenoloid bodies, Purification of. Koppers Co. February 15, 1919.
140,797. Liquid fuels. U.S. Industrial Alcohol Co. October 12, 1917.
143,212. Glucose from wood, Process of and apparatus for obtaining. H. Terrisse and M. Levy. May 13, 1919.
143,242. Acid sulphoamino dyestuffs, Process for dyeing with—and the manufacture of new lakes. Farbenfabriken vorm. F. Bayer & Co. October 31, 1914.
146,214. Iron-salt, Process for the production of a solid non-hygroscopic. O. Rohm. June 26, 1920.
147,101. Pyridine bases, Manufacture of. Farbwerke vorm. Meister, Lucius & Brüning. December 23, 1918. Addition to 146,869.
148,339. Anthraquinone series, Manufacture of a new colour of. L. Cassella & Co., Ges. March 15, 1915.
161,244 Amonia, Method and means for use in the manufacture of. R. P. Douglas. December 31, 1919.
161,253. Petroleum and analogous distillates, Process of cleaning and refining. A. J. Paris. January 2, 1920.
161,269. Pressure-digesters or autoclaves. H. Edenborough. January 5, 1920.
161,273. Acid sodium pyrophosphate, Manufacture of. A. Kelly. January 5, 1920.
161,280. Pigments, Process of making. L. R. Baker. January 6, 1920.
161,294. Cellulose, Fermentation of. Power Gas Corporation, Ltd. and H. Langwell. January 8, 1920. Addition to 134,265.
161,310. Alumina and its salts, Process for the extraction from clay. H. G. Wildman. January 14, 1920.
161,375. Calcined ore and the like, Pre-leaching apparatus for use in the treatment of. E. C. Vigeon and J. McConway. February 6, 1920.
161,439. Sulphur, Apparatus for the manufacture of oxygen compounds of. T. A. Clayton. April 9, 1920. Addition to 141,661.

Applications for Patents

Accioly, F. de M. Manufacture of an alcoholic liquid (synthetic) gas for use as combustible. 11,419. April 20.
Alby United Carbide Factories, Ltd., and Dodd, A. H. Manufacture of salts of guanidine. 11,646. April 22.
Allen & Hanburys, Ltd. Titration or neutralisation of chemical compounds. 11,659. April 22.
Bowler, L. P. Methods of distilling from crude petroleum. 11,623. April 22.
Büchler, H. Process for production of boro-disalicylic acid. 11,553. April 21.
Calorizing Corporation of America. Metallic alloys. 11,311. April 19.
Coles, S. O. Cowper-. Manufacture of bronze powders. 11,520. April 21.
Continuous Reaction Co., Ltd., Manufacture of ferro-tungsten and ferromolybdenum. 11,786. April 23.
Courtaulds, Ltd. Production of compounds or mixtures of starch and sulphuric acid. 11,767, 11,772. April 23.
,, Manufacture of carbon bisulphide. 11,771. April 23.
Delph, A. E. Manufacture of carbon bisulphide. 11,771. April 23.
Dreyfus, H. Manufacture of cellulose derivatives. 11,293. April 19.
Feldenheimer, W., and Plowman, W. W. Process for grading alkaline-earth carbonates. 11,358. April 19.
Hanovia Chemical & Manufacturing Co. Means for producing photographic soft focus effects. 11,592. April 21.
Imray, O. (*Soc. of Chemical Industry in Basle.*) Manufacture of α-aminoanthraquinone. 11,459. April 20.
Jackson, W. J. Mellersh-. (*Hanovia Chemical & Manufacturing Co.*) Means for producing photographic soft focus effects. 11,592. April 21.
Kobayashi, K. Fire-engine. 11,225. April 18.
Lizius, J. L. Titration or neutralisation of chemical compounds. 11,659. April 22.
Lloyd, J. A. Production of compounds of starch and sulphuric acid. 11,772. April 23.
Low Temperature Carbonisation, Ltd. Retorts. 11,222. April 18.
Merson, J., and Skelly, J. M. Manufacture of ferro-tungsten and ferro-molybdenum. 11,786. April 23.

Patents Court Cases

AN application has been made under Rule 7 of the Patents (Treaty of Peace) Rules, 1920, by Scottish Dyes, Ltd., Murrell Hill Works, Carlisle, for the grant of a licence in respect of patent 13,241/1912 (Akt.-Ges. für Anilin Fabrikation), which relates to the manufacture of 2-halogen-5-acidyl-aminobenzoylbenzoic acids. Any notice of opposition must be given by May 20, 1921.

Proposed New Normal Weight for the Saccharimeter

AT present the normal weight in almost universal use for the saccharimeter (or polarimeter reading the percentage of sugar directly) is 26·0 grms., this standard having been adopted by the International Commission for Uniform Methods of Sugar Analysis in 1900. On dissolving 26·0 grms. of pure sucrose in water, and making the liquid up to 100 metric c.c. at 20°C., a solution is obtained which in a 200 mm. tube reads exactly 100·0 scale divisions, corresponding with 34·657±0·023 angular degrees with spectrally purified sodium light. In France a normal weight of 16·29 grms. is largely used.

The proposal was, however, recently made by Dr. C. A. Browne and other American chemists to adopt a sugar scale having a normal weight of 20 grms., the principal advantages claimed being: (1) It is a compromise between the 26·0 and 16·29 grms. scales; (2) the results obtained are easily converted into percentages by multiplying by 5; (3) aliquot portions of 50, 25, 20 and 5 c.c. of the 20 per cent. solution represent even gramme quantities; and (4) the specific rotation of sucrose at a concentration of 20 grms. in 100 c.c. (18·62 per cent. by weight) is about the maximum. It was further argued that the factor for conversion into circular degrees—namely, 100=34·657—is inaccurate in view of the work of Bates and Jackson published in 1916, and that the present is an opportune time for adopting a new factor and a new standard. French chemists decided to support their American colleagues in adopting the 20 grms. normal weight.

In order to elicit the opinion of British chemists in the matter, a committee was formed consisting of the following: Professor Arthur R. Ling, F.I.C. (who acted as chairman), Professor Thomas Gray, D.Sc., Ph.D., F.I.C., L. J. de Whalley, B.Sc., F.I.C., Hugh Main, B.Sc., and J. P. Ogilvie, A.I.C. (secretary). This committee drew up a statement of the arguments *pro et contra*, nearly 2,000 copies of which were sent to chemists engaged in the sugar and allied industries, both in this country and in the British Colonies.

An analysis of the replies received shows about 72 per cent. of the correspondents to be opposed to the adoption of the new standard. Most of these replies stated as the reason for the decision that the advantages claimed for the proposed new standard were too slight to compensate for the considerable inconvenience, expense and confusion that would (it was considered) be involved by its adoption. A very frequent additional reason was that, owing to the smaller amount of sample taken for the assay, the accuracy of observation would be diminished. In an addendum to his reply, A. F. Blake, chief chemist, Atlantic Sugar Refineries, Ltd., St. John, N.B., Canada, said that he thought the 26 grms. value should be retained regardless of whether Herzfeld's or Bates' and Jackson's factor is the correct one, or whether future investigations provide still another, "new instruments being made according to the best factor available at the time, and old ones being controlled and corrected by quartz plates standardised according to the latest factor."

It would therefore appear that British chemists are largely in favour of retaining the present international standard, which, in fact, is now in almost universal use (excepting in France in Mauritius).

Acquisitions at the Science Museum

AT the Science Museum, South Kensington, the collections have been placed on the upper floor of the western galleries, which will be reopened to the public on May 1. The collection of scientific apparatus has been re-arranged. A series of early optical instruments, early photographic apparatus and modern pyrometers have been added.

Manufacturers' Recipes

W. G. FOYLE & CO., LTD., booksellers, 121-125, Charing Cross Road, W.C. 2, announce that Jameson's well-known work, "Manufacturers' Practical Recipes," is available in four volumes, at 30s. each. It contains a collection of original recipes and processes (English, Continental and American), with full working instructions for manufacture.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, APRIL 28.

There has been a slight improvement in the demand for chemicals during the past week, but trade generally is stagnant, and is likely to remain so until the labour trouble passes away—for a time at any rate.

There is a limited export inquiry; the situation generally is still uninteresting.

General Chemicals

ACETONE stocks have been severely depleted, and the firmer tendency is fully maintained.

ACID ACETIC.—The market is decidedly stronger. The demand only attains small proportions.

ACID CITRIC has a rather better tendency, and there are indications that the price has touched bottom.

ACID FORMIC is in very poor inquiry, and the price is inclined to favour buyers.

ACID OXALIC is in fair demand, and the tendency is again firmer.

ACID TARTARIC.—The price is still influenced by second-hand realisations, whilst only a small volume of business can be detected.

BLEACHING POWDER remains very slow, and little is doing either on home trade or export account.

COPPER SULPHATE shows no improvement, but if the upward movement in several Continental exchanges continues, the position of the article may improve.

FORMALDEHYDE.—Stocks are small, and are firmly held at recent rates.

LEAD ACETATE is practically without a market, and the outlook is most unsatisfactory.

POTASSIUM BICHROMATE is in very small demand, and the price continues to droop.

POTASSIUM CAUSTIC.—What little buying there is, is only of the hand-to-mouth variety. Prices nominally unaltered.

SODA ACETATE is only in small demand, but is firmer in tone.

SODA BICHROMATE is still a second-hand market, and values continue to be depressed.

SODA CAUSTIC is slow of sale, and resale parcels may be had on advantageous terms.

SODA HYPOSULPHITE is still a weak market.

SODA NITRITE.—Inquiry is almost non-existent, but at the same time the elimination of German competition has had a firming effect upon prices.

SODA PRUSSIATE has been reduced in price by the English makers.

Coal Tar Intermediates

Business continues quiet, being still under the influence of the coal strike. Values are well maintained however, and one or two products are inclined to be firmer.

ALPHA NAPHTHYALMINE is quietly steady with no change in price.

ANILINE OIL AND SALT are in slightly better demand at last quoted figures.

BETA NAPHTHOL is in moderate request only, without change in value.

BETA NAPHTHYLAMINE is asked for, and a moderate trade is being transacted.

DIMETHYANILINE is in small request and price is inclined to sag.

DIPHENYLAMINE is in better demand and price is very firm.

DI NITRO CHLOR BENZOLE is in request and the value is firm.

NITRO BENZOLE passes steadily into consumption without change in value.

PARANITRANILINE is more active, and the price is maintained.

PARATOLUIDINE is idle and the market is weak.

SALICYLIC ACID is very firm, and the price has an upward tendency.

Coal Tar Products

The demand for coal tar products continues to be poor, and prices show no improvement, although in some cases supplies are scarce owing to the continued strike.

90's BENZOL is in short supply, although prices remain at 2s. 10d. in the North, and 3s. in the South.

PURE BENZOL is quoted at 2s. 11d. in the North and 3s. 1d. to 3s. 2d. in the South.

CREOSOTE OIL is quoted at from 7¼d. to 8d. in the North, and in the South the price is in the region of 9d.

CRESYLIC ACID remains unchanged.

SOLVENT NAPHTHA is quoted in the region of 1s. 9d. on rails.

HEAVY NAPHTHA is worth 2s. 2d. to 2s. 3d. per gallon on rails.

NAPHTHALENE shows little improvement. Prices for crude remaining from £8 to £12 per ton, and for refined from £18 to £23.

PITCH.—Business remains very quiet and very few new transactions have transpired. Prices remain more or less nominal, at about 60s. f.o.b. east coast, and about 65s. to 70s. f.o.r. London.

SULPHATE OF AMMONIA.—The demand for home trade as well as for export is falling off. Prices remain unchanged.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	95	0	0	to	100	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst	ton	69	0	0	to	70	0	0
Carbolic, cryst. 39-40%	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	2	6	to	0	2	8
Formic, 80%	ton	80	0	0	to	85	0	0
Gallic, pure	lb.	0	4	3	to	0	4	6
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	42	10	0	to	45	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	0	10	to	0	0	11
Phosphoric, 1.5	ton	55	0	0	to	57	0	0
Pyrogallic, cryst	lb.	0	8	0	to	0	8	3
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Salicylic, B.P.	lb.	0	1	6	to	0	1	9
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	9	to	0	1	10
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	65	0	0	to	70	0	0
Ammonia, muriate (galvanisers)	ton	55	0	0	to	57	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	420	0	0	to	425	0	3
Arsenic, white, powdered	ton	55	0	0	to	60	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	55	0	0	to	56	0	0

	per	£	s.	d.		£	s.	d.
Barium Sulphate, blanc fixe, dry...	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp ...	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	20	0	0	to	21	0	0
Borax crystals	ton	34	0	0	to	36	0	0
Calcium acetate, Brown.....	ton	12	0	0	to	13	0	0
,, Grey.....	ton	19	0	0	to	21	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride.....	ton	12	10	0	to	13	0	0
Carbon bisulphide.....	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate.....	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	35	0	0	to	37	0	0
Cream Tartar, 98-100%.....	ton	140	0	0	to	150	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.....	ton	120	0	0	to	122	10	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts, commercial	ton	6	0	0	to	7	0	0
Glycerine, crude.....	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	50	0	0	to	52	0	0
Carbonate (White Lead).....	ton	43	0	0	to	46	0	0
Nitrate.....	ton	55	0	0	to	57	0	0
Litharge	ton	38	10	0	to	40	0	0
Lithopone, 30%	ton	30	0	0	to	32	10	0
Magnesium chloride.....	ton	15	10	0	to	16	10	0
Carbonate, light.....	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	10	10	0	to	11	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate.....	ton	70	0	0	to	75	0	0
Sulphate	ton	75	0	0	to	78	0	0
Methyl acetone.....	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	ton	145	0	0	to	150	0	0
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt.....	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	45	0	0	to		—	
Potassium bichromate	lb.	0	0	9½	to		—	
Carbonate, 90%	ton	55	0	0	to	60	0	0
Chloride.....	ton	38	0	0	to	40	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	200	0	0	to	210	0	0
Nitrate, refined	ton	50	0	0	to	52	0	0
Permanganate	lb.	0	2	0	to	0	2	3
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow.	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	3	15	0	to		—	
Seconds	cwt.	3	10	0	to		—	
Sodium acetate	ton	35	0	0	to	37	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	7½	to	0	0	8
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial.....	ton	22	0	0	to	24	0	0
Nitrite, 96-98%.....	ton	50	0	0	to	52	0	0
Phosphate, crystal.....	ton	25	0	0	to	27	0	0
Perborate.....	lb.	0	1	9	to	0	2	0
Prussiate	lb.	0	0	8	to	0	0	8½
Sodium Sulphide, crystals	ton	20	0	0	to	23	0	0
Sulphide, solid, 60-62%	ton	40	0	0	to	41	0	0
Sulphite, cryst.....	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride.....	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	3	to	0	2	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)....	lb.	0	1	8	to	0	1	9
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%.....	ton	60	0	0	to	65	0	0
Oxide, 99%.....	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine.....	lb.	0	3	0	to	0	3	3
Aniline oil, drums extra	lb.	0	1	7	to	0	1	8
Aniline salts	lb.	0	1	8	to	0	1	10
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine).....	lb.	0	4	9	to	0	5	0
Benzidine, base	lb.	0	10	6	to	0	11	0
Benzidine, sulphate	lb.	0	9	6	to	0	10	0
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate.....	lb.	0	8	0	to	0	8	6
Betanaphthol	lb.	0	2	9	to	0	3	0
Betanaphthylamine, technical.....	lb.	0	9	6	to	0	10	0
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline.....	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol.....	lb.	0	1	8	to	0	1	9
Dinitrophenol.....	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	0	to	0	5	3
Diphenylamine.....	lb.	0	5	0	to	0	5	3
H-Acid.....	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	0
Monosulphonic Acid (2:7).....	lb.	0	7	6	to	0	8	0
Naphthienic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda.....	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid...	lb.	0	5	0	to	0	5	6
Nitronaphthalene	lb.	0	1	5	to	0	1	6
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base.....	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine.	lb.	0	2	3	to	0	2	6
Orthonitrotoluol.....	lb.	0	1	0	to	0	1	2
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	3	to	0	4	6
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol.....	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled ...	lb.	0	13	6	to	0	14	6
Paratoluidine.....	lb.	0	7	6	to	0	8	0
Phthalic anhydride.....	lb.	0	4	9	to	0	5	6
Resorcin, technical	lb.	0	7	6	to	0	8	0
Resorcin, pure	lb.	0	8	9	to	0	9	0
Salol..	lb.	0	3	6	to	0	3	9
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Application for Discharge

SAMUEL J. LEEK, a partner in the firm of Wilkie & Leek, manufacturing chemists, formerly of 1, Falcon Grove, Battersea, applied at the London Bankruptcy Court on Tuesday for an order of discharge, he and his partner T. Wilkie having been adjudged bankrupts in June, 1903.

Mr. Walter Boyle, Official Receiver, estimated the ranking liabilities at £557 and reported that the assets had realised £114. A dividend of 2s. 9d. in the £ was paid. It appeared that the applicant, a Belgian subject, began business at the above address in 1902, and in January following the debtor Wilkie joined him. Two months later the business was removed to 35, Bedford Road, Clapham. The insurance company refused to accept fire risk on the new premises, and in May, 1903, they were destroyed by fire, stock to value of £350 being destroyed. The Sheriff had levied execution at the premises under a judgment a few days before the fire and later he sold the salvaged stock for £40. The business was quite solvent before the fire, though there had been a loss on the trading. The failure was entirely due to the fire.

The only ground of opposition to the discharge raised by the Official Receiver was the fact that the assets were less than 10s. in the £.

Mr. Registrar Mellor granted the discharge subject to a suspension of one month.

Company News

BRUNNER, MOND & CO.—At an extraordinary meeting of the preference shareholders, held in Liverpool on April 21, a resolution was passed sanctioning a number of minor alterations in the articles of association of the company. The principal alteration was to authorise the sub-division of each £10 preference share into 10 shares of £1 each, 10 such £1 shares carrying one vote at a poll, and increasing the dividend from 7 to 7½ per cent. per annum; also giving the directors authority to underwrite any new issue.

ANGLO-GREEK MAGNESITE.—A Stock Exchange announcement states that dealings in 32,374 ordinary shares of £1 each, fully paid, Nos. 74,001, to 106,374, have been specially allowed under Temporary Regulation 4 (3). These securities will rank *pari passu* with those in which special settling days have already been appointed, as soon as they are identical, and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted. A further notice states that dealings in the following shares have been allowed and the shares are now included with those in which a settlement has already been granted:—65,207 ordinary shares of £1 each; fully paid, Nos. 1 to 15,728 and 24,422 to 73,900.

LEVER BROTHERS.—In the course of his speech at the annual general meeting of Lever Brothers, Ltd., on April 20, Lord Leverhulme, referring to the figures in the balance sheet, drew attention to an increase of £21,061,767 in the issued share capital. This increase was accounted for as follows:—Capitalisation of reserves on consolidation of capital, £3,927,595; in acquiring further preference and ordinary shares in existing associated companies, £4,827,884; co-partnership shares and sundries, £306,288; new issues, £12,000,000. The increase in debentures, shares, loans to less deposits of associated companies and investments, amounting to £24,180,419, was accounted for as follows:—As to approximately £10,000,000 by the purchase of Niger shares and advances to and shares taken in the Company's previous West African interests; as to £4,500,000 by share in British companies previously referred to; as to £7,750,000 by shares in overseas associated companies; and the balance was represented by advances to and shares acquired in other companies. Their stock was lower, but this apparent reduction was merely due to writing down stock values. The increase in freehold and leasehold works, premises and plant had been very heavy last year, but they had now closed down on all development, and could well afford to do so, as their works, premises and plant were in excellent condition and ample for all present requirements.

Government Contracts

The following were among the Government contracts let during March:—

ADMIRALTY.—*Stereophagus Pumps:* Pulsometer Engineering Co., Ltd., London, S.W.

WAR OFFICE.—*Acetylene Gas:* Allen Liversedge, Ltd., London, S.W. *Ferro Silicon:* T. H. Watson, Sheffield. *Ganister:* Astbury Silica Co., Stoke-on-Trent.

POST OFFICE.—*Apparatus, Protective:* Evershed & Vignoles, Ltd., London, W.

HIGH COMMISSIONER FOR INDIA.—*Carbon:* J. Baker & Sons and Perkens, Ltd., London, W.C. *Crucibles:* Morgan Crucible Co., London, S.W. *Ferrosilicon:* G. G. Blackwell, Sons & Co., Ltd., Liverpool. *Microscopes, &c.:* Standley, Belcher & Mason, Birmingham. *Paint:* Brimsdown Lead Co., Ponders End. *Salts, Galvanisers:* Brunner, Mond & Co., Ltd., Northwich. *Voltoids:* Brunner, Mond & Co., Ltd., Northwich. *Zinc:* Eyre Smelting Co., Ltd., London, S.W.

CROWN AGENTS FOR THE COLONIES.—*Blasting Powder:* Curtiss & Harvey, Ltd., London, E.C. *Drugs, &c.:* Burgoyne, Burbidges & Co., London, E.; Howards & Son, Ltd., Ilford. *Laboratory Equipment:* Baird & Tatlock, London, E.C. *Novarsenobillon:* May & Baker, Ltd., London, S.W.

H.M. PRISON COMMISSION.—*Drugs and Sundries:* Burgoyne, Burbidges & Co., London, E.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Egypt ...	Drugs; chemicals. Tenders received by the Director of Stores, Department of Public Health, Cairo	—
Austrian ...	Lead; zinc. Replies to the Dement of Overseas Trade, 35, Old Queen Street, London, S.W. 1.	—
Budapesth ...	Leather skins; tanning materials	597
Cairo	Coal Tar	—
St. John, New Brunswick	Chemicals	520
Danzig ...	Oils; fats	529a
Italian ...	Crude linseed oil	534
Norwegian ...	Chemicals	537
Norwegian ...	Oils; fats; soaps	539
San Sebastian	Chemicals; glassware	542
New York ...	Varnishes; enamels	548

Tariff Changes

GOLD COAST.—A duty at the rate of ½d. per lb. or part thereof is imposed on all kola nuts exported from the Gold Coast Colony by sea.

MONTSERRAT.—Calcium arsenate may now be imported free of Customs duty.

PALESTINE.—The importation of saltpetre and opium is only permitted under special licence issued by the Director of Public Security and the Department of Health respectively.

CHILE.—Increases in import duties on the majority of articles are notified in the *Board of Trade Journal* (April 21, pp. 453-4), but the following articles are excepted: Benzine, solid paraffin wax, petroleum and other mineral oils not specially mentioned, and prussian blue and ultramarine blue in any form.

FRANCE.—The prohibition on the export of soaps (other than perfumed soaps), except under licence, is now withdrawn.

MEXICO.—Crude mineral oil, sulphuric acid, detonators, dynamite, blasting powder for mines, pyroxylin or gun cotton, and other explosives not specially mentioned in the tariff, are now admitted free of duty.

NETHERLANDS.—The prohibition on the exportation of fertilisers of all kinds and material used for the manufacture of fertilisers is withdrawn as from April 1.

NORWAY.—The following goods are subject to licence on export from Norway: Cellulose and wood pulp, copper pyrites and cupreous purple ore, cyanamide, nitrate of lime, and superphosphates.

Coal Tar for Cairo

TENDERS are invited by the 15th May for the supply of 1,000 tons of coal tar to the Roads Office Tanzim Department, Cairo, to be delivered between July 1 and October 15. Alternative prices can be quoted for British Standard Specification No. 2 or any coal gas tar suitable for road spraying. The conditions of tender are those usual in contracts made by the Egyptian Government, and tenders will only be accepted from firms having agents or representatives resident in Egypt. No special form of tender is required, though a sample of the tar offered must be submitted.

German Reparations Duty

AN Order (No. 6) of the Board of Trade under the German Reparation (Recovery) Act states that any article which is proved to the satisfaction of the Commissioners of Customs and Excise to have been produced or manufactured in the Saar Basin as defined by Article 48 of the Treaty of Versailles shall be exempt from the provisions of the Act.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnerships Dissolved

JONES, A., and MUNFORD, C. S., carrying on business as chemical manufacturers, at Fuller's Hill, Great Yarmouth, under the style of Shoe Trade Chemical Co., by mutual consent as and from April 9. All debts received and paid by A. Jones, who will in future carry on the business at the above address under the style of the Shoe Trade Chemical Co.

SIGRIST, R. H., and STAMP, E. K., carrying on business as drug store proprietors, at Hanham Street, Hanham, Bristol, by mutual consent, as from February 1, 1921. All debts will be received and paid by G. H. Wiseman, who will in future carry on the business under the style of Sigrist & Co.

WILLIAMS, C. S., and DAWE, H. J., carrying on business as chemical produce merchants, 12, Aldgate, London, E.1, under the style of Williams & Dawe, by mutual consent, as and from April 9. All debts received and paid by H. J. Dawe, at the above address.

Company Winding Up

TYNE CHEMICAL PRODUCTS., LTD., 16A, Grainger Street, Newcastle-on-Tyne. Date of order, April 22, 1921. Date of presentation of petition, April 7, 1921.

Companies Winding Up Voluntarily

CASSON CHEMICAL CO., LTD. (in voluntary liquidation).—A meeting of creditors will be held at Caxton Hall, Caxton Stree , Westminster, London, S.W.1, on May 3, at 11 a.m. Creditors' claims on or before May 23, to Mr. P. S. Booth, 28, Kimberley House, Holborn Viaduct, London, E.C.1, Liquidator.

MAPLE CHEMICAL WORKS, LTD. (in voluntary liquidation).—A general meeting will be held at 16, Grosvenor Place, London, S.W.1, on Friday, June 3, at 4 p.m. N. B. Horowitz, Liquidator.

MASTERSON ROUMANIAN OIL SYNDICATE, LTD. (in voluntary liquidation).—A meeting of creditors will be held at the company's office, 29, Great St. Helens, London, E.C.3, on Monday, April 25, at 11 a.m. S. J. Lee, Liquidator.

ZINC OXIDE MANUFACTURING CO., LTD. (in voluntary liquidation).—A general meeting of members will be held at 20, Acresfield, Bolton, on Monday, May 23, at 3 p.m. W. Dutton, Liquidator.

Liquidators' Notices

NORTH WALES PLATE GLASS INSURANCE CO., LTD.—An extraordinary general meeting of members will be held at Madoc House, Lloyd Street, Llandudno, on Friday, May 27, at 2.30 p.m. J. H. Jones, Liquidator.

TEXAS OILFIELDS, LTD.—A general meeting of members will be held at 58, Coleman Street, London, on Tuesday, May 31, at 12.30 p.m. S. W. Runtz, Liquidator.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

CARBOS CHEMICAL CO., LTD., Smethwick.—Registered April 13, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Reliance Works, Smethwick. *£1,000. March 10, 1919.

DORMAN (W. H.) & CO., LTD., Stafford.—Registered April 12, £40,000 (not ex.) charge, to Lloyds Bank, Ltd.; charged on factories, buildings, &c., at Stafford. *Nil. October 29, 1920.

LEVER BROTHERS, LTD., Port Sunlight.—Registered April 13. Trust Deed dated April 11, 1921, securing £15,000,000 debenture stock; charged on various lands and buildings, &c., also general charge. *Nil. March 25, 1920.

WHEELTON COP DYEING & BLEACHING CO., LTD.—Registered April 13, charge, to Williams Deacons Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Sich Mill, Wheelton.

Satisfactions

NORTHFLEET PORTLAND CEMENT CO. (1917), LTD., London, E.C.—Satisfaction registered April 14, £10,000, registered November 13, 1918.

Bill of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

CRIMES, R. F., 48, Queen's Road, Norwich, analytical chemist. Filed April 25. £50.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

CLAYTON & CO., 3, Rushey Green, Catford, chemists. £11 1s. 9d. March 8.

DOWSONS, LTD., 2, Market Place, Colne, chemists. £16 11s. 9d. March 8.

TEMPERLEY, T., 7, Flora Street, Ashton-in-Makerfield, glass blower. £12 14s. 9d. March 4.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2.:—

ASIATIC PETROLEUM COMPANY (PORTO RICO), LTD. Producing, refining and distributing petroleum and other oils, etc. Nominal capital £100,000 in 10,000 shares of £10 each. Directors: To be appointed by subscribers. Subscribers: T. P. Winterbotham and K. Kenneth Lee.

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA PROPRIETARY, LTD (1957F), Pinners Hall, Austin Friars, London, E.C. Incorporated in Victoria. To refine, amalgamate, manipulate, electrolytically or otherwise treat and prepare for market ores, metals, fluxes and mineral substances, etc. Nominal capital: £3,000,000 in 3,000,000 shares of £1 each. Name of person authorised to accept service: A. J. Smith.

FLETCHER WAREHOUSE, LTD., 125, Bowling Old Lane, Bradford, chemists. Nominal capital: £2,000 in 2,000 shares of £1 each. Directors: To be appointed by subscribers. Qualification of directors: 20 shares. Subscribers: F. Waterhouse and Hilda Waterhouse.

FULLER (RALPH L.) & CO. (EXPORT), LTD., 21, Harp Lane, E.C., chemical merchants, importers and exporters. Nominal capital: £10,000 in 10,000 shares of £1 each. Directors: F. I. Hibbert, D. Simpson and J. Cameron. Qualification of directors: 1 share.

ABDUL ISHMAL HAMIRA & CO., LTD. Manufacturers medicinal, chemical, industrial and other preparations. Nominal capital £2,000 in 2,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, 50 shares. Subscribers, H. Mutch, A. Brodie.

SHAW & FINDLAY, LTD., 68, Brixton Road, S.W. Chemists and druggists. Nominal capital £3,500 in 3,500 shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, 1 share.